‘Suitable and Sufficient’?

UK Regulation of

Post-construction Fire Safety

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Declaration

I declare that this thesis has been composed solely by myself and that it has not been submitted, in whole or in part, in any previous application for a degree. Except where states otherwise by reference or acknowledgement, the work presented is entirely my own.

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‘As almost all fires arise from inattention in one shape or another, it is of the utmost importance that every master of a house or other establishment should persevere in rigidly enjoining and enforcing on those under him, the necessity of observing the utmost possible care in preventing such calamities, which, in nineteen cases out of twenty, are the result of remissness or inattention ... Immense hazard is frequently incurred for the most trifling indulgences, and much property is annually destroyed, and valuable lives often lost, because a few thoughtless individuals cannot deny themselves the gratification of reading in bed with a candle beside them.’

(Braidwood, 1866, pp.33-4)

‘The first principle is that you must not fool yourself, and you are the easiest person to fool’

(Feynman, 1992, p.343)

‘Wisdom is the principal thing, therefore get wisdom, and with all thy getting, get understanding. Exalt her and she shall bring thee to honour’[1]

(Proverbs 4:7)

[1]The inscription carved around the dome of McEwan Hall, the graduation hall of the University of Edinburgh.

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Lastly, but by no means least, my thanks go to my partner Deb without whose unshakeable faith in my capability along with her unselfish and wholehearted support the ideas described in this thesis would have remained as 'vapours floating in the Ether' (Halley, 1753, p.L1113).

Abstract

There have been considerable reductions in UK fire deaths and casualties over the last fifty years, but on-going innovation in the built environment means that fire risks need constantly to be reappraised and addressed. This innovation takes the form not only of new materials and architectural approaches, but also of new methods of fire safety regulation. While existing research has addressed many aspects of this innovation, one crucial area has been neglected: that of post-construction fire safety regulation. This thesis examines this topic focusing on how fire safety is maintained during the life times of buildings. All new buildings have fire safety features that are a requirement of design approval, but these need to be maintained and used appropriately for the remainder of the building's operational life.

The key development in UK post-construction regulation in recent years has been the shift towards self-regulation in which the onus is on *duty holders* (usually the employer) to assess and maintain an appropriate level of fire safety. This thesis documents the emergence, rationale, and operation of this system, and addresses key issues and concerns with the way it functions.

In particular, the efficacy of the current UK approach to post-construction regulation depends on the capacity of duty holders to carry out suitable fire risk assessments, either themselves or by employing suitable fire risk assessors. However, this hinges not only on whether a sufficient number of assessors have sufficient competence, but also on the ability of the assessor to understand the intended functionality of the original fire safety design, approved in the pre-construction phase. In addition, the system relies on external oversight by the fire and rescue services for high-risk premises, and this thesis explores the way that this fire and rescue service role has evolved, and its current rationale for deciding which premises are sufficiently high risk to audit.

Drawing on interviews with key actors such as fire safety engineers, fire safety managers, fire risk assessors, and fire safety enforcement officers, the thesis unravels this complex system of regulation. This analysis suggests that the system at present has internal inconsistencies that call into question its effectiveness, highlights the concerns of many of those central to the operation of the regulation, and provides evidence from serious fires and other regulatory breaches to support the conclusion that UK post-construction regulation could be more effective.

Glossary

There are many terms and phrases used in this thesis that, for one reason or another, can be confusing. This Glossary is an attempt to address that confusion by explaining some of those terms and their contexts to try to achieve a consistency throughout the document. This approach also serves to introduce terms that will be met later on in the thesis.

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1. Who regulates fire safety in the UK?

The current regulatory framework of fire safety has evolved from the recommendations arising from the Holroyd Committee when it reported in 1970. The Holroyd Committee thought that the regulation of fire safety should be split between two regulators. The Committee determined that the phase involving the design and construction of a building up until its completion was very different from the phase involving the occupation of the building from completion to demolition. The former involved the work of professional designers and construction workers working together to complete a precise project within a defined time period. The latter involved the occupation of the building by different groups of people for a variety of different purposes for lengthy periods of time. In this thesis, the former phase is referred to as the pre-construction phase and the latter phase, the post-construction phase. Holroyd recommended that the pre-construction phase should be regulated by the local authorities using building control officers and the post-construction phase should be regulated by the fire authorities using fire prevention officers.

A second regulator for the pre-construction phase emerged with the enactment of the Building (Approved Inspectors etc.) Regulations (1985) and the setting up of a system to regulate private building control officers to be known as approved inspectors[2]. The advantage of an approved inspector over a local authority building control officer, is her ability to operate anywhere in England

[2] It is important to note that approved inspectors only operate in England and Wales because Northern Ireland and Scotland have chose not to introduce the necessary legislation.

and Wales. This is quite advantageous for a company or business that operates nationally because of the limitations of the local authority building control. The local authority building control officer only has responsibilities within the administrative area of that local authority, whereas, the approved inspector can operate in any administrative area in England and Wales. National companies, such as supermarkets who choose to build a chain of properties in different towns and cities, exploit this advantage because, during the pre-construction phase of construction, they only have to deal with one regulator for all of their properties.

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2. With regard to the current fire safety regulatory regime, who is the responsible person and who is the duty holder?

Fire safety legislation has traditionally identified the person who has the responsibility of carrying out the duties imposed by the legislation. Fire safety legislation has largely been tied to places where people are employed to work and so, logically, the employer has been the person or corporate body that has been the recipient of the legal expectations. However, the identity of the person with responsibility is not so clear cut in, say, a building containing multiple employers, each with their own employees, who might all be affected by one fire incident anywhere in the building. In England and Wales, the regulations attempt to end the confusion by suggesting a hierarchy of persons who may bear the responsibility at the time of the offence and thus the title of *Responsible person*; if it is a workplace, then the employer is responsible, if there is no employer, then it is the person who has control over the premises or, if this cannot be determined satisfactorily, then it is the owner of the building

(Regulatory Reform (Fire Safety) Order, 2005, s.3).

In Scotland, a hierarchy also exists specifying who bears the responsibility. However, a source of confusion exists because the Scottish Government, in enacting the Fire (Scotland) Act (2005), has not chosen the same nomination for the person who bears the responsibilities. The Fire (Scotland) Act (2005) nominates the employer as having duties towards the employees if the premises is a workplace; or the person having control over the premises, if not a workplace; or the employee in co-operating with an employer (Fire (Scotland) Act, 2005, s.53, 54, and 56). Unlike the Regulatory Reform (Fire Safety) Order (2005, s.3) which nominates the *Responsible person*, the Fire (Scotland) Act (2005) does not specify a nomination. However, in guidance notes, the person on whom the duties fall is described as the *Duty holder* and so this term has become the Scottish counterpart to the English and Welsh term, *Responsible person*.

This thesis, where it does so, generally compares the regulations in England and Wales against those in Scotland, and because of the difference in names there is a source of potential confusion in writing about the duties and responsibilities provided in the regulations. This is the reason why the term *Duty holder* has been chosen as the term to describe the person whose responsibility it is to carry out the duties required by the legislation both in England and Wales, and in Scotland.

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3. Why is Scotland's legislation different to that of England, Wales, or

Northern Ireland?

There are four countries that currently make up the United Kingdom; they are England, Northern Ireland, Scotland and Wales. Before the partition of Ireland, the collective name for the United Kingdom was the United Kingdom of Great Britain and Ireland which was sealed in the Union with Ireland Act (1800). In 1921, when Southern Ireland gained independence and became, initially, the Irish Free State, then Eire, and currently the Republic of Ireland, the collective name was changed to the United Kingdom of Great Britain and Northern Ireland.

Of the four countries that currently make up the UK, only Scotland has its own Parliament due the privileges conferred by devolution under the Scotland Act (1998). Scotland has the autonomy to make laws on a range of issues while still being a member of the United Kingdom. Northern Ireland and Wales have devolved assemblies, rather than devolved governments, but they also have a certain amount of autonomy to make delegated legislation within their borders. The Parliament in London is the United Kingdom Parliament making primary legislation for the administration of England, Northern Ireland and Wales.

It is important to note that although there is a separate privileged body that administers legislation in the nations of Northern Ireland, Scotland and Wales, there is no privileged body that administers legislation in England. England is administered by the UK Parliament because there is no devolved Government or Assembly in England. Notwithstanding, there is now a procedure that allows the UK Parliament to divide on certain issues that are determined to be applicable to England only. English votes for English laws (EVEL) was introduced in

2015 and allows Parliament to exclude Northern Ireland, Scottish and Welsh Members of Parliament from voting on solely English issues. The procedure is in use for both primary and delegated legislation[3].

Another important note is that there is no equivalence amongst the four privileged bodies; the Northern Ireland Assembly, the Scottish Parliament and the Welsh Assembly all have devolved powers from the UK Parliament but the UK Parliament remains the sovereign parliament. Also there is no equivalence amongst the status of the Northern Ireland Assembly, the Scottish Parliament or the Welsh Assembly, or their devolved powers. With regard to fire safety legislation, there are differences within the four countries although the methodology and effect of the legislation is generally the same. Fire safety legislation in England, Northern Ireland and Wales originates from the same primary legislation with tailored statutory instruments and statutory rules while fire safety legislation in Scotland now originates from its own primary legislation, the Fire (Scotland) Act (2005). Where comparison is instructive, the thesis makes comparisons between fire safety legislation in England and Wales, and Scotland.

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4. With regard to fire safety legislation in the UK, what is primary legislation and what is delegated legislation?

In the United Kingdom (UK), the development of fire safety legislation involves a mixture of primary and delegated legislation. An Act of Parliament

[3] An infographic showing the process of English Votes for English Laws (EVEL) can be found online at https://www.parliament.uk/about/how/laws/bills/public/english-votes-for-english-laws/

such as the now superseded Fire Precautions Act (1971) is referred to as primary legislation. A Statutory Instrument such as the current Regulatory Reform (Fire Safety) Order (2005) is referred to as delegated legislation (or secondary or subordinate legislation). Primary legislation is typically categorised as legislation, while delegated legislation can be categorised as legislation, regulation, statutory rules, or codes of practice, dependent on its form. Despite the potential confusion in referring to either primary or delegated legislation the key point is that, in its effect, there is no difference. Both primary and delegated legislation have an equal amount of force in UK law. The concept behind the introduction of delegated legislation was to make parliamentary procedure more efficient.

Acts of Parliament make up the body of Statute law and are part of the UK constitution. An Act originates as a Bill of Parliament which, if it is passed by both Houses of Parliament through a process of debates and committees, receives Royal Assent[4], and becomes an Act of Parliament, it is then part of the UK constitution and law. Powers can be provided in an Act of Parliament to enable delegated legislation to be brought in by a Minister in a more efficient and faster process. For example, the Regulatory Reform (Fire Safety) Order (2005) is a statutory instrument enacted by powers provided in the Regulatory Reform Act (2001).

The process by which delegated legislation becomes law is less protracted than the process for primary legislation because it does not go through the same procedure. Prospective delegated legislation starts with an idea devel-

[4]Royal Assent is the Monarch's agreement to making an Act of Parliament. Nowadays regarded as a formality, Royal Assent was last withheld on 11 March 1708 when Queen Anne withheld her assent on the Scottish Militia Bill amid mounting fear of the disloyalty of the Scots.

oped by experts in the field organised by a government department which then benefits from a consultation process of interested parties. Once finalised the document is said to be 'laid on the table in the House of Commons' for forty days, in which any Member of Parliament can pick it up and query its contents. If the document is not objected to within that time period, it can be signed off as law by the Minister of the department that produced it.

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5. Does Europe have an influence on fire safety and workplace legislation in the UK?

The United Kingdom is currently a member of the European Community and its legislation is influenced by decisions of the European Parliament. The European Parliamentary process involves the use of Directives which impose legislative measures on all the member countries of the European Community (EC). In response, the member country is expected to effect the Directive in its own domestic legislation.

In 1989, the European Parliament promulgated two Directives which are commonly known as the Framework Directive and the Workplace Directive[5]. The UK's response to the Directives was the bundle of regulations that became known as the six-pack regulations, covering different aspects of health and safety in the workplace and, with respect to fire safety, the Fire Precautions (Workplace) Regulations (1997). The methodology called for in the Directives and thus in the application of the Fire Precautions (Workplace) Regulations

[5] More detail on the effect of the European Directives can be found on page 89 in Chapter 4.

(1997), was, generally, the same methodology already used in the Health and Safety at Work etc. Act (1974), that is, self-regulation using the methodology of a risk assessment. The same methodology of self-regulation is now used in the current fire safety regulation, the Regulatory Reform (Fire Safety) Order (2005).

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6. What is a fire authority, what does it represent, and what are its responsibilities?

The fire authorities were bodies set up under the Fire Services Act (1947) with the powers necessary to gather together the resources necessary to carry out the fire-related tasks listed in the legislation. Each county and county borough becoming a fire authority by dint of this legislation had duties ranging from securing the people, accommodation and equipment necessary to fight fires to the recruitment and training necessary to give advice on fire prevention in premises within their jurisdiction.

The term fire authority referred to the people who made up the governing body; these were elected representatives of the local council chosen to serve as members of the fire authority. The term *fire brigade* was used to describe the firefighting force administered by the *fire authority*. However, for many people, the terms *fire authority* and *fire brigade* are synonymous and the differentiation between these two terms is indistinct and of little consequence; such that they use the term *fire brigade* or *fire service* when they actually mean *fire authority*.

There is further confusion created by devolved governmental responsibilities amongst the four nations of the UK. The Fire and Rescue Services Act (2004) enacts a number of principles important in understanding the confusion:

1. It modifies the term fire authority into the fire and rescue authority and in London, for example, it further modifies the term into the *London Fire and Emergency Planning Authority*.

2. It devolves the Act's duties in Wales to the National Assembly for Wales but it does not do the equivalent for the arrangements in Northern Ireland.

3. It exempts Scotland from a large part of the Act because the same responsibilities in Scotland are enacted in the Fire (Scotland) Act (2005). However, although initially Scotland retained its fire authorities, under the **?** Scotland's eight fire and rescue authorities became one single Scottish Fire and Rescue Service (SFRS) under the aegis of the Scottish Parliament. This means that, unlike the rest of the UK where the responsibility for each fire and rescue service is devolved to local fire and rescue authorities, in Scotland the fire and rescue service is a Governmental responsibility. In respect of Scotland, it is also important to note that the acronym SFRS has a dual role. SFRS not only refers to the operational firefighting force, accommodation, appliances, and so on in Scotland, but it also refers to the controlling authority made up of members of the Scottish Parliament and referred to as *The Board*.

4. Although the fire authority in Northern Ireland was not subject to the Fire and Rescue Services Act (2004), it was the subject of the Fire and Rescue Services (Northern Ireland) Order (2006) made under the Northern Ireland Act (2000). Section 3 of this Order explains that the *Fire Authority for Northern Ireland* has been dissolved and the *Northern Ireland Fire and Rescue Board (NIFRB)* has been created in its place. The Fire and

Rescue Services (Northern Ireland) Order (2006, s.3(2)) also clarifies that the NIFRB is the fire and rescue authority for Northern Ireland.

The term *fire and rescue service* can also be confusing. The fire and rescue service has traditionally been known as the fire brigade which was the denomination given in the Fire Services Act (1947) to the assembly of people, accommodation, and machinery that the newly created fire authorities were to administer. However, the name of the Act itself (Fire Services Act, 1947) is confusing as it addresses itself to the services that the fire brigade was expected to carry out. This confusion has been further compounded when the word *rescue* was added by the Fire and Rescue Services Act (2004). The addition was made to reflect the added statutory responsibility of dealing with road traffic collisions (RTC[6]). Following the promulgation of the Fire and Rescue Services Act (2004), many of the fire brigades took the opportunity to rename or re-brand themselves making use of the title of the Act. Thus, for example, Leicestershire Fire Service became Leicestershire Fire and Rescue Service but West Midlands Fire Service chose to remain as West Midlands Fire Service. Perhaps the most confusion is caused by the name of the fire and rescue service that carries out its responsibilities in the capital city of London. The London Fire Brigade have chosen to retain the name they adopted in 1904.

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7. Who is the building designer?

[6]Road traffic collisions (RTC) were previously referred to as road traffic accidents (RTA). The change reflects the concept that the word collision implies culpability on the part of someone or something, whereas the word accident implies a lack of culpability. However, the change of expression is held by many to be contentious.

Reference is made in this thesis to the *building designer*. This is meant as a general term used to describe the individual or team of individuals that are brought together, under the leadership of an architect, to solve the problems posed by the particular design of the building or the requirements of the building regulations. If a client wants a building built, initially, she visits an architect who draws a design that satisfies the client and which the architect agrees to build. The architect invites specialists from different fields to become members of a building design team who set about solving the problems posed by the structure, layout, and necessary facilities in terms of the design of the building and the requirements of the regulations. With regard to fire safety, a fire safety engineer looks to achieve the requirements of building regulations for fire safety which involves negotiations and compromises with other specialists such as structural and electrical engineers, and also with the pre-construction regulator. The term building designer, therefore, is meant as a collective term for the skilled professional people who come together to work as a project team.

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8. What is meant by the term Building control, what does it represent, and what are the responsibilities associated with it?

Building control is taken as the collective term used for describing the administration of a process that regulates the standard of the design and construction of a building up until its completion. This interpretation is a general societal interpretation and not just effected for this thesis. The completion of a building signals a major change in the environment when the designers, construction workers, and regulators walk away to turn their attentions to other projects and an occupier moves in as the next phase in the life of the building. Another interpretation of the term building control could conceivably describe this next phase where an occupier takes control of the building. However, when a building is occupied and people and business processes are involved, control of the building is usually referred to as building management.

Local authorities have had the responsibility for building control since 1840 when the first national building regulations were enacted, even though this was a voluntary responsibility and not a mandatory one (Ley, 2000). The responsibility remained solely that of local authorities until the enactment of the Building (Approved Inspectors etc.) Regulations (1985) when, in England and Wales only, an element of competition was introduced by allowing individuals or private companies to compete against the local authorities. Subject to certain conditions, individuals or private companies who are qualified as approved inspectors can carry out the same work as a building control officer employed by a local authority.

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9. What is meant by the term level of safety?

The building designer, when trying to satisfy the regulator, is trying to achieve a level of safety that will comply with the regulations and therefore satisfy the regulator, and create a safe environment in the completed building. The term *level of safety* refers to a measurement of the safety enjoyed by an occupant of the building from the risk of fire once the building has been completed and occupied. However, the term is a contentious one because it is a concept that encompasses many variables and cannot be measured with any certainty.

The term is used in the standard provided for fire engineering projects where it suggests that a comparison against a prescribed building code will offer an acceptable level of safety (British Standard 7974, 2001, s.8.1), sometimes referred to as equivalency. Equivalency is difficult to evaluate because there are so many variables that influence the concept, not least being the unpredictable behaviour of the building users themselves.

The term is related to the phrase *margin of safety* which is used to identify the gap between two other uncertain concepts used in calculating an acceptable level of safety; these are, the required amount of time (RSET) and the available amount of time (ASET) necessary for an occupant to safely evacuate a building.

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Introduction

An employee or member of the public expects that when they enter a building, either by implicit or explicit invitation, they have the right to consider that their safety is assured. In the event of a fire whilst they are in the building, they expect to be able to exit the building safely long before the atmosphere in the building becomes untenable. This expectation applies whether they are an employee at their workplace or a guest in a hotel, whether they are abled or disabled, whether they are young or old. To a large extent these expectations are met because the last fifty years have seen a marked decrease in fire deaths generally in the UK (despite the increasing population). For example, the statistics for England in 2016/17 show 219 fire deaths in dwellings which is significantly lower than the 586 fire deaths recorded in England in 1981/82.. The fire at Grenfell Tower on 14 June 2017, has served to reverse the trend by producing a figure of 262 deaths in England in 2017/18 but it is too early to say whether this is a real reversal or a merely a temporary outlier in the data[7].

The regulation of fire safety in the UK is administered in two separate ways. One set of regulations, overseen by one regulator, deals with the design of a building (the pre-construction stage) while another set of regulations, overseen by a second regulator, covers the occupation of a building (the post-construction stage). Pre-construction fire safety regulation is applied to all buildings, is predicated on the purpose of the building, and is intended to establish a fire-safe environment by determining the nature of the fire safety design. Post-construction fire safety regulation is applied to the majority of buildings, is largely self-regulated, and its objective is to maintain (or re-establish) a fire-

[7]Source: Spreadsheet FIRE0502: Fatalities and non-fatal casualties by fire and rescue authority and location group available at https://www.gov.uk/government/statistical-data-sets/fire-statistics-data-tables

safe environment. Single family dwellings are exempt from post-construction fire safety regulation despite this being the location where most fire deaths occur in the UK.

Historically, the decreasing level of fire deaths and injuries suggests that fire safety regulation is having a beneficial influence, however, innovation in building materials and architectural design along with changes in regulation – particularly the neo-liberal deregulation that began with the Thatcher government in the 1980s – mean that continuation of the historical trend of reducing fire deaths is not a given (as perhaps evidenced by the Grenfell Tower fire). Both pre- and post-construction fire safety regulations have undergone major changes in recent years, and the consequences of these changes, individually and in terms of the interactions between the two, may prove to be important.

In particular, while the regulation of building design has led to the incorporation of many fire safety features, what happens via post-construction fire safety regulation during the building's lifetime is crucial to the continuing value and effectiveness of those features. As Latour and Yaneva (2008, p.80) note, 'a building is not a static object fixed in time but a moving project ... once it has been built, it ages, it is transformed by its users, modified by all of what happens inside and out'. In some cases, even apparently minor changes due to renovation or poor maintenance can significantly diminish the effectiveness of the original fire safety design. In addition, the way people use buildings can also degrade the embedded fire safety features to a significant extent, even when those features apparently remain intact and in place. For example, the ability of fire doors to limit the spread of smoke and fire is dependent on building users not wedging such doors open. Even so, many fire safety designs incorporate such doors without consideration of the actual practice of building use in which many occupants regularly, if unintentionally, subvert the intention of their design. Over the long lifetime of a building the way a building is used may change many times, and in so doing, perhaps, invalidate the fire safety design envisaged for the original use.

A tragic example of the kind of consequences that can result from a failure in post-construction fire safety practice was seen in the early hours of 31 January, 2004, when a fire started in an electrical cupboard in the Rosepark Care Home in Uddingston, Lanarkshire. Fourteen residents, representing just over 40% of the total number of residents, died as a result. Sheriff Principal Brian Lockhart, in his fatal accident inquiry report, stated that 'the management of fire safety at Rosepark was systematically and seriously defective' (Lockhart, 2011, s.DS3.1, p.46) and that it 'did not have a proper appreciation of its roles and responsibilities in relation to issues of fire safety' (Lockhart, 2011, Chapter 45(3), para.14(a), p.873). The inquiry report evidenced several failings that indicated that the care home managers and staff were operating the facility in a way that undermined the effectiveness of the original fire safety design. For example, they did not realise the full implications of fire safety regulations, the responsibilities placed upon themselves, and, in particular, did not comprehend that fire risk assessment demands a specialist expertise. Nor did they understand the importance of the repair and maintenance of the fire installations and equipment in supporting the safe environment envisaged by the building designers.

The full details of Rosepark are presented later (in Chapter 6); however it is noteworthy that key failings concerned the way that fire and smoke were able to spread rapidly because the fire compartmentation was inadequate. Not only was vital fire equipment missing[8], but the victims were vulnerable because the fire equipment was also being abused. For example, the self-closing devices

[8]For example, fire dampers needed to complete compartmentation, though specified on the warranted drawing, were not fitted (Lockhart, 2011, p.31). An explanation about fire

on bedroom doors had been disabled, and only three out of fourteen bedroom doors in the affected corridors were closed at the time of the fire (Lockhart, 2011, Chapter 29, p.554).

The Rosepark fire showed the potential dangers posed by buildings in which the effectiveness of the original fire safety design is subverted during post-construction usage. Such events are relatively rare but there is no guarantee that the historical trend of decreasing casualties will continue given the pace of innovation in building practices, materials, and especially regulatory approaches. Given the risks involved, it is wise to apply the *precautionary principle* (Levidow and Morris, 2001; Abraham and Davis, 2009), and to seek to understand how changes in post-construction regulatory practices may affect fire safety.

Fundamentally, the key question in this thesis is whether current UK post-construction regulation is fit for purpose[9]. How has it evolved? What are its purported mechanisms of operation? How does it relate to pre-construction regulation and the fire safety features that are approved in a building's original design? To what extent have recent regulatory innovations changed the way that the system operates and do these changes have the potential to undermine the historical trend in fire death reduction in the UK? What criticisms do key actors make of the system currently in place, and how can these potential failings be addressed?

This thesis thus traces the development of fire safety regulation in the UK in order to understand the origins and motivation for recent changes, taking care to note regional differences (typically Scottish regulations differ, sometimes sig-

dampers, their purpose, and their specific applicability to the Rosepark fire can be found in Lockhart (2011, Chapter 44(3)(F), p.795).

[9]One of the findings from the *Independent Review of Building Regulations and Fire Safety: Interim Report*, published following the drafting of this thesis, was that 'the current regulatory system is not fit for purpose in relation to high-rise and complex buildings' Hackitt (2017, p.16).

nificantly, from those in England and Wales[10]). Drawing on concepts from Science and Technology Studies (STS), this study will take a *historical sociology* (Mackenzie, 1990) approach to understand the way that fire safety regulation has changed over time, enabling comparative analysis both chronologically as well as between different jurisdictions within the UK. Care will be taken to distinguish between *policy and practice* in so much as the actual operation of post-construction regulation differs from its purported rationale.

A historical sociology is more than an amalgamation of history and sociology. Historians tend to organise their research around the dominant questions of national politics comparing the social processes occurring around one remarkable event with another from a different time and place. History has a ‘heavy reliance on documentary evidence and its consequent concentration on the literate world’ (Tilly, 1990, p.686) and its characteristics include identifying the relevant actors, imputing their particular attitudes and motives, validated by documentary evidence, and then presenting the outcome as a narrative. Sociology, on the other hand, raises fundamental questions about how people live their lives and how living in a society affects their behaviour. It is concerned with ‘social behaviour, why people behave as they do, what factors in society affect their behaviour, how groups of people in society organise themselves and come to be as they are’ (Thompson, 1982, p.1). As a result ‘sociologists have found themselves calling into question unduly idealized versions of science, and in that way have contributed to the development of a well-informed society’ (Barnes et al., 1996, p.110).

With regard to technological developments historical sociology provides an approach that draws attention to the study of the social shaping of a technol-

[10]This thesis draws attention to differences between the separate regulatory regimes of England and Wales, and Scotland. Northern Ireland has not been included, however, its regulatory regime stems from the same legislation used in England and Wales.

ogy and its social context over a period of time. As Mackenzie (1990, p.9) argues 'technological change is simultaneously economic, political, organizational, cultural, and legal change' and thus 'cannot be explained in isolation from the economic, political, and other social circumstances of that change'. This approach draws on foundational work in STS, particularly with regard to the concerns of the sociology of scientific knowledge and what scientists collectively do; 'with how, why, and with what consequence' (Barnes et al., 1996, p.110). Fire safety regulation is central to the maintenance of the fire safety of buildings, and a historical sociology approach enables an understanding of the dynamic nature of the way that regulatory processes operate rather than a static snapshot of policy at any particular point in time.

Perhaps the concept can be made clearer by examining how historical sociology can be applied to the technology of post-construction fire safety. There are a number of puzzling axioms that exist in the regulation of fire safety in the UK that need to be analysed and presented to enable a more comprehensive understanding. For example, the regulation of fire safety is divided into two regulatory regimes; pre-construction and post-construction. A historical sociology will not only recount when the division took place but it will also offer an explanation of how and why the division took place. It does this by informing the reader of the contextual environment surrounding the division and the particular pressures contributed by principal actors whose behaviour created the environment. Another example is the nuanced differences between the regulation of fire safety in different parts of the UK. A historical sociology offers a comparison of not only what differences there are but also an analysis of why they exist, along with a theory that fits the available evidence for their existence.

Data is provided by interviews with a wide range of key participants, as well as an in-depth review of the technical literature, and government and operational documents. The key, broad question at the heart of this thesis is whether post-construction regulation in the UK is adequate to prevent the reoccurrence of incidents such as that which occurred at Rosepark (and others). The focus here is on operational practices that implement and maintain fire safety features rather than how society defines or measures adequacy with regard to fire safety, or whether the initial building design is appropriate. Although concepts such as *fire risk* and *level of safety* are central to this study, reliance is made on the actors own framing of these terms rather than seeking to explicitly quantify and calculate them. This thesis is not therefore primarily focussed on the design of the built environment and how *adequate safety* is determined and achieved, although these are relevant issues; rather, the main focus is on how and to what extent the fire safety design initially approved is maintained and operated during the lifetime of a building, and importantly, how this is influenced by UK post-construction regulations.

The following chapter sets out a theoretical context for understanding the issues faced by UK post-construction regulation, and will develop research questions to guide the analytical focus of the thesis. Chapter 3 then sets out the methodological approach used, and notes potential limitations. Chapter 4 provides a chronological overview of the development of UK fire safety regulations, focussing particularly on recent changes in post-construction regulation. Next, Chapter 5 documents the way that the key shift towards self-regulation as a mechanism for post-construction regulation has been implemented, specifically focussing on the role of the fire risk assessment in this process. In Chapter 6 the operation of post-construction regulation is exemplified through a number of case studies that describe regulatory breaches that have occurred in the recent past. Chapter 7 returns to the research questions set out in

Chapter 2 with analysis of the descriptive material supported by evidence drawn from the interviews. Finally, Chapter 8 provides conclusions and makes recommendations for a way forward.

Eland House

A short description of an incident that occurred in 2010 will serve to set the scene and give a flavour of the general thrust of this thesis. This anecdote is compelling because it involves Eland House, which was then one of the premises occupied by the Department of Communities and Local Government (DCLG). The DCLG was the UK Government Department that introduced and administered the current UK post-construction fire safety regulations and, as such, it was subject to the very regulations that it administered (albeit that it was defined as Crown Premises[11]). However, although DCLG was responsible for the change of regulation in 2006 (described later) it was subsequently found to be in breach of them.

As reported by IFSEC Global[12], the online website for the fire and security industry, and the BBC[13], Eland House was inspected in 2010, four years after the key change in the regulations, and with ample time having elapsed for the regulations to have become embedded in the management system for the building. However, the fire safety enforcement officer who carried out the fire safety audit on Eland House found that the premises were in breach of the regulations. In fact, the fire safety enforcement officer identified that the premises were in breach of thirteen of the fifteen Articles written into the

[11] Crown Premises (i.e. premises occupied by the Crown) are bound by the Regulatory Reform (Fire Safety) Order 2005, except for the enforcement and prosecution provisions. Enforcement in Crown Premises is carried out by Crown Premises Fire Inspectors but without the capability of prosecution.

[12] Source: http://www.ifsecglobal.com/exclusive-enforcement-notice-details-wide-ranging-fire-safety-breaches-at-clg-headquarters

[13] Source: http://www.bbc.co.uk/news/uk-10715889

post-construction fire safety regulations, some of which were considered to be serious.This was particularly embarrassing because the Government Minister accountable for the national administration and application of the regulations themselves may also have been the individual accountable for ensuring the self-regulated compliance with the regulations within Eland House. The report detailing the fire safety inadequacies was not made public and, in all likelihood, would have remained confidential had a prominent fire safety consultant not decided to submit a request for information under the Freedom of Information Act 2000.

Finally, it is worth noting that the tragic Grenfell Tower fire occurred during the final stages of writing this thesis. While the full explanation for the June 2017 Grenfell Tower fire must wait for the results of full and detailed investigation, that disaster potentially highlights the importance of both pre- and post-construction fire safety regulation – in terms of the amount and quality of regulation, and in ensuring that the regulation is suitably followed and implemented – in keeping people safe. Who is responsible for ensuring compliance with the regulations and in ensuring an adequate standard of fire safety in a premises, and whether they are competent to undertake this duty, are matters of major significance that will presumably now be scrutinised. The research presented in this thesis is highly relevant in this context.

Literature Review

Introduction

About regulation

Societies have long regulated the built environment and other technologies in order to limit adverse outcomes. King Hammarubi who reigned in Babylon from 1792 to 1750 BC is credited with some of the first regulations governing the construction of buildings as part of the 282 Judgements that make up the Code of Hammarubi, one of the earliest surviving codes of law. Hammarubi's pursuit was of a stable society where people were punished for societal wrong-doing, though his Judgements were perhaps harsh by today's standards. For example, one of his most widely quoted rules states that, 'If a builder has built a house for a man and has not made strong his work, and the house he built has fallen, and he has caused the death of the owner of the house, that builder shall be put to death' (Johns, 2007, p.48).

Although the definitions of regulations vary, the intention of regulation is to control and influence those actions and behaviours that affect society (Rahim, 2013). For example, regulation of financial services is intended to make sure the system is fair, efficient, and transparent so as to maintain customer confidence (Mwenda, 2006). In general, 'regulation consists of employing suitable means to maintain a system in a desired state' (Braun and Wield, 1994, p.259).

Although many technologies are developed to provide benefits to society (for example, drugs to cure illness, transport systems to aid movement, or buildings to provide shelter), these technologies also often bring new risks, such as fire in the case of buildings. Societies regulate technologies with the aim of maximising the benefits while minimising the risks. Regulation of technology can thus be seen as a means of steering a regulated industry away from socially undesirable outcomes towards more preferable ones.

Historically, regulatory changes have often come about due to disasters or significant failings that have caused public outcry. The Government is prompted to respond in the face of public anger and typically does so by changing the relevant regulatory regime. For example, in respect of the coal mining industry, the Aberfan disaster in 1966 provided an incentive to address concerns with regard to the way in which the UK coal industry managed and stored its waste material. Waste material, or in this case, coal spoil, collected as a consequence of mining the coal mines surrounding Merthyr Vale in Wales, was stored in spoil heaps on the side of the valley high above the town of Aberfan in a way that suited the operation of the coal mining company. Worries had been expressed locally about the conical tips of coal spoil and the possibility of their moving and threatening the village below given the right conditions. This tragically occurred on 21 October 1966 when the underground springs beneath the coal tips, swollen by recent wet weather, liquefied the spoil causing it to slip down the side of the valley engulfing the Pantglas School in Aberfan (Howe, 1968; Couto, 1989).

The subsequent inquiry into the tragedy, which caused the deaths of 144 people, 116 of them schoolchildren, encouraged the coal mining industry to initiate a policy on safe storage of coal mining spoil. The Government made it compulsory that dangerous occurrences associated with the storage of coal mining spoil, should be reportable occurrences, and all spoil tips should be inspected by Her Majesty's Inspectorate of Mines and Quarries, who reported on their stability and encouraged good practice in the storage of coal mining spoil (Houses of Parliament, 1967; HC Hansard, 1967).

Similarly, a new approach to legislation resulted from an occurrence at a

Union Carbide chemical plant producing pesticides at Bhopal, India, in 1984. During the night of 2 December, 1984, a leak of vapour from the plant initiated what may well be the largest ever single industrial accident in terms of its impact on society. According to the company, an employee had sabotaged the plant by deliberately introducing water to the chemical Methyl Isocyanate. The result was the leak of a poisonous vapour, which, within a week had caused the deaths of nearly 3000 people with more than 300,000 people being affected by exposure to the vapour (Shrivastava, 1987; Jasanoff, 1994; Kletz, 2011). The Bhopal incident also resulted in the amendment of earlier European legislation enacted in the wake of the explosion caused by leaking cyclohexane at Flixborough, Lincolnshire in 1974 and the vapour release of 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD) near the town of Seveso, Italy in 1976 (Kletz, 2011). The Seveso Directives[14] aimed to prevent and/or limit the impact and effects of major accidents involving dangerous substances (Kirchsteiger et al., 1998).

Regulation takes different forms in other industries. For example, pharmaceutical regulation encompasses not only the way that the industry carries out its product development and production, but also the performance of those products on patients. Regulation of medicine is ‘a public policy response to the perceived problems or perceived needs of society’, necessary to ‘ensure the safety, efficiency and quality of drugs as well as the accuracy and appropriateness of the drug information available to the public’ (Ratanawaijitrasin and Wondemagegnehu, 2002, p.1). Much of the regulation of today’s medicines with regard to the ethical principles embedded in the approach can be traced back to particular historical experiences during the Second World War. The

[14]The Seveso Directive, June 1982 (European Directive 82/501/EEC) and Seveso II, 9 December 1996 (European Directive 96/82/EC). Seveso II was replaced by Seveso III on 4 July 2012.

ethical principles of good clinical practice, the standard for the design, study, and analysis of medicines, can be traced back to the Nuremberg Trials in 1945-6, following the cessation of hostilities at the end of the war. Responding to the evidence of the 'murderous and tortuous human experiments in the concentration camps' (Shuster, 1997, p.1436), the American judges overseeing the prosecutions formulated what came to be known as the Nuremberg Code. The Nuremberg Code comprised the aspirations of the American judges that have 'served as a blueprint for today's principles that ensure the rights of subjects in medical research' (Shuster, 1997, p.1436). The Code included such concepts as: having the voluntary consent of the patient before research is commenced; having sufficient knowledge to justify the experimentation on humans; making as sure as possible that the potential results could not have been gathered in some other way; and so on (Shuster, 1997).

While the ethical principles of good clinical practice can be traced back to the conduct of medical personnel in the Second World War concentration camps, the nature of medicine regulation in the UK can be traced back to the introduction of Thalidomide and the consequent birth defects. The tragedy involving the drug Thalidomide has had a long-lasting impact on the regulation of the pharmaceutical companies. Before the tragedy, the regulation of the pharmaceutical industry was extremely light when compared with present day regulation of the industry. After the tragedy 'came to light in 1961 the [British] Government considered legislation to regulate drug safety with more urgency than ever before' (Abraham, 1997, p.161).

The aftermath of the Thalidomide tragedy formed the backdrop for the debate leading up to the Medicines Act (1968). The sub-committee headed by Lord Cohen was influential in the debate when it reported in 1963 recommending that all new medicines should be considered by a Committee on the

Safety of Drugs (CSD). The CSD, under the chairmanship of Lord Dunlop, commenced its work in 1964 and was the precursor of the Committee on the Safety of Medicines (CSM), a statutory body enacted under the Medicines Act (1968). The CSM working voluntarily with the pharmaceutical industry, established the Yellow Card Scheme, a reporting scheme that puts an expectation on general practitioners, physicians, pharmacists, and even patients themselves to report any adverse reactions from medicines that may become apparent to them (Abraham, 2002b). The Medicines Act (1968) replaced much of previous medicine-related legislation and introduced a licensing system to control the production of medicines. It brought together everything to do with the control of medicines, for both human and animal use, including their promotion and sales, and specified that all medicines on the British market had to go through a process of peer review before approval.

The pharmaceutical case highlights one of the challenges for regulation; that of reliance on industry expertise leading to a form of 'regulatory capture' (Slayton and Clark-Ginsberg, 2017). Because regulators typically have less expertise than those they regulate there is an 'expertise asymmetry' (Spinardi, 2016) that can undermine the ability of regulators to form unbiased opinions on drug safety. For example, in the case of Triazolam, a medicine used for the treatment of insomnia, lax regulation when it was originally developed saw it approved for use despite insufficient evidence of its safety in clinical trials. Since its introduction in the 1980s, Triazolam has had its licence suspended and was withdrawn from use in the UK, Norway and Denmark in 1991 because it was considered that the risks through using the medicine outweighed its benefits. In the USA, where the medicine was originally trialled, Triazolam is still in use but its dose level is now recommended at no more than half the original dose level (Abraham, 1995, 2002a).

At variance to the pharmaceutical industry, the aviation industry has an enviable safety record. The aviation regulatory model appears to be a good one as it has produced an industry that has increased its safety record since the 1970s[15]. Because the aviation industry involves a wide range of specialised technologies, it would be difficult for the regulator to be the expert in every aspect of the construction and operation of a plane, yet the regulator is the final arbiter. The Federal Aviation Administration (FAA) explicitly deals with this expertise asymmetry by delegating tasks to employees of the companies whose technology it is regulating. These Designated Engineering Representatives (DERs) necessarily have the tacit knowledge to be able to make complex judgements about the performance of the technologies that they develop. The regulator thus recognises its own limitations in the difference of expertise that exists between the manufacturer's engineers and its own staff. By appointing industry staff to carry out the regulation, the regulator 'depends heavily on a cadre of insiders ... with their greater access, knowledge, and experience ... to help it assess new systems' (Downer, 2010, p.88). The regulator is placing a responsibility on them and extending trust that they will honour it. Once problems have been resolved and the solutions deemed acceptable, the regulator will type certify the aircraft as an indication of its airworthiness.

However, regulation aimed at ensuring a particular level of performance for products such as medicines or aircraft may be undermined by dangerous outcomes that stem from human behaviour as a result of individual and organisational error or bias. For example, the Space Shuttle Challenger disaster of 28 January 1986 demonstrated how deviance from rules can be accepted, and lack of failure interpreted as success, so long as a catastrophic failure does not occur. The Challenger Shuttle launched and landed successfully

[15]More information, including statistics, about the safety of aviation can be found at http://www.baaa-acro.com/statistics (accessed on 15 Dec 2018)

nine times before its final flight, when 73 seconds into its launch the O-ring seals, a mechanism designed to prevent the escape of hot gases from the solid rocket motor assembly, failed, leading to a catastrophic course of events. The resulting explosion completely destroying the shuttle-rocket assembly, killing all seven crew on board (Vaughan, 1996).

The proximate cause of the accident was quickly ascertained and easily understood, but the events that had created an environment where such an accident could take place were more difficult to comprehend. The cause of the accident, the failure of the O-ring seals, was a known risk. Evidence that the O-rings were vulnerable to hot gases due to movement in the joints of the solid rocket boosters during flight, had been collected and examined when it had been discovered on previous flights (Vaughan, 1996). The problem had been discussed between the National Aeronautics and Space Administration (NASA) and the manufacturers of the rocket booster on a number of occasions. Both organisations failed, firstly, to recognise the phenomenon as a significant problem and then, secondly, to fix the problem. As the official report into the disaster concluded: 'At no time did management either recommend a redesign of the joint or call for the Shuttle's grounding until the problem was solved' (Rogers, 1986, p.121). Tests carried out following the recovery of the rocket boosters to understand the scope of the occurrence involving the O-rings only resulted in both organisations noting the increasing amount of damage. However, because the amount was small and incremental, they determined it as an acceptable risk.

Explanations for the course of events leading up to the disaster focus on the way that behaviour ordinarily considered to be deviant or abnormal becomes accepted and routine over a period of time. Vaughan (1996) argues that this normalisation of deviance led NASA and its industrial partners to gradually accept practices that deviated from their stated policies. This phenomenon has also been described as practical drift, ‘the slow, steady uncoupling of local practice from written procedure’ that becomes ‘legitimized through un-remarkable repetition’ (Snook, 2000, pp.149 and 182). Richard Feynman, the Nobel physicist, compared the launch of a shuttle to a game of Russian Roulette; his point being that it was wrong to suppose that the odds changed with each successive launch of the shuttle. He suggested that NASA and the rocket manufacturer’s adopted a theory that assumed that ‘[w]e can lower our standards a little bit because we got away with it last time’ (Rogers, 1986, p.149). NASA’s decision-makers gradually changed the rhetoric of their launch criteria after each successful flight from one of needing to be convinced that the shuttle was ready to fly, to one of needing to be convinced that the shuttle was not ready to fly (Starbuck and Milliken, 1988).

In a fire safety related example, Stollard (2014) maintains that a similar process of practical drift can be observed in the way that the operation of shopping malls undermines their original fire safety design. Stollard (2014) argues that shopping malls were designed with the assumption that they would have sterile common areas, defined by the absence of combustible materials. The particular design premise is based on ensuring the existence of sufficient distance between a shop unit on one side of the mall and a shop unit on the other side of the mall. The distance from one side of the mall to the other has to be sufficiently great that it will prevent a fire transferring across the mall by radiated heat. However, the spread of retail franchises being allowed to set up their stalls on the centreline of the mall, a phenomenon prevalent in many shopping malls, effectively divides the mall into two halves. The consequence of this could be that it has negated the design premise by halving the distance for the fire to transfer by radiated heat. Once the fire in a shop unit on one side of the mall has ignited a retail franchise on the centreline of the mall by radiated heat, it is then able to ignite a shop unit on the other side of the mall by radiated heat. Effectively, the existence of combustible material along the centreline of the shopping mall provides the path for a fire to jump across the mall.

Going against the original design premise of shopping malls is what some would consider to be deviant behaviour being accepted over time. Without empirical evidence to the contrary (a major shopping mall fire), the behaviour of shopping mall owners, and those charged with regulating their safety accept greater risk because of the lack of consequences from the incremental steps away from the original design rationale.

Regulation of technology thus faces several challenges. On the face of it, the regulation of an industry depends on two main factors: the Government's attitude to the risks posed by that industry; and the ability of regulators to understand the performance of technology. When initiating regulation, a Government provides the legal framework of the duties and responsibilities that constitute the regulation. This includes the scope of the regulation, the boundaries within which the regulation will be implemented and how the regulation sits amongst other regulations. A Government will create a regulator, firstly, when it becomes clear that legal rules are necessary to control behaviour, and secondly, when the Government is of the opinion that the accumulation of knowledge and expertise over time by the regulators will be of significant benefit to the public (Niles, 2002).

However, this can prove to be quite difficult unless the control is exerted when the technology is first introduced. The regulatory dilemma is that when a technology is introduced, it is not clear how it will be used and what amount of social control will be necessary to manage it. Efforts to regulate, at the initial stage, can be ineffective and unnecessary. When the necessary amount of regulation becomes clear, the opportunities to steer the technology in the socially desirable direction may already have been missed: 'When change is easy, the need for it cannot be foreseen; when the need for change is apparent, change has become expensive, difficult and time consuming' (Collingridge, 1980, p.11). Moreover, as shown by the brief survey above of examples of regulatory episodes and disasters, a major challenge for regulation lies in defining and achieving the goals that encapsulate society's requirements.

Typically, two main regulatory approaches are used to achieve the desired level of performance, prescriptive regulation or performance-based regulation. Prescriptive regulation is comparatively easy to follow because it consists of a prescribed list of rules that should be followed with relatively little room for interpretation. A checklist might be a good analogy: the regulator assesses whether the item on the list has been achieved and then checks off the item. Once all the items on the list have been checked off, the desired outcome should have been achieved. If, because there has been an incident that shows the failure of the regulations and that the desired outcome has not been achieved, the list can be reviewed and amended to attempt to prevent a recurrence of the failure. The list would be made up of the actions and behaviours that are necessary to achieve the desired outcome, setting out what is and what is not acceptable. The rules would be predictable and this assists the regulated industry in achieving them. The ways of achieving them and the equipment used in their achievement become commonplace and comparatively easy to obtain and use.

In contrast, performance-based (or functionally- or objective-based) regulation sets out functional or performance requirements that should be achieved by the regulated industry. Functional requirements are goals to be achieved but without the regulator stipulating precisely how they must be achieved. The challenge here is that this type of regulation depends on the ability of regulators 'to specify, measure and monitor performance, and reliable and appropriate information about performance may sometimes be difficult if not impossible to obtain' (Coglianese et al., 2002, p.2). Performance-based regulation is widely considered more flexible than prescriptive regulation and is purported to give the regulated industry scope to innovate with new technology. Prescriptive regulation can in principle only allow this if it has been amended by the regulator, and this makes it slow to react to new technology, and liable to inhibit innovation. Prescriptive regulation inherently assumes that all the regulatory components are installed adequately and will perform satisfactorily, but the regulatory measurement focuses on the existence of the component, rather than its performance. This is quite different from performance-based regulation where the focus is on whether a technology has achieved (or will achieve) the desired result.

The ability to measure performance is central to an effective performance-based approach, with a crucial distinction being whether it is considered satisfactory to rely on retrospective measurement of performance or whether prospective performance must be predicted. The first of these approaches to performance-based regulation measures actual outcomes and need not require the regulator to have in-depth knowledge of the processes being regulated. For example, the classic example of end-of-pipe effluent regulation used to limit the pollution of rivers and other water bodies depends on knowledge about the harmful effects of the pollutants (e.g. what level of concentration is acceptable) and on the reliability of measurement techniques, but does not require any understanding of the industrial processes involved in producing the pollutants (Clayton et al., 1999). Typically, if certain levels of pollutants are recorded, either in the effluent discharges themselves or in the water body receiving them, this will result in fines, or if judged particularly serious, legal action to stop operations. Likewise, in regulation of the built environment, acoustic standards can be enforced by measuring acoustic performance directly (Moiseev, 2011).

However, this end-of-pipe approach requires tolerance of unsatisfactory outcomes. It may provide a suitable approach for regulation of effluent from paper mills or breweries (most of whose discharges are only harmful to ecosystems in excessive concentrations), but such an approach is reactive, and thus not acceptable where high consequence outcomes are possible. For example, it would not be socially acceptable to regulate airliner safety by measuring the number of crashes and fining the manufacturers or operators accordingly. Catastrophic aircraft failure is infrequent, and regulatory control cannot rely only on assessing the reasons for accidents, and correcting failings thus revealed (though this does of course happen). Instead, proactive regulation is needed in which satisfactory performance is sought by oversight of the processes involved in producing an airliner and its component technologies (Downer, 2010).

Traditionally, regulation of fire safety has operated through prescriptive rule-following based on lessons learned from previous fires and was referred to as stable-door legislation. Grice (2009, p.14) describes this as ‘an introduction of fire laws after the fatal events, rather than legislation introduced proactively as a result of the lessons learned from earlier fire tragedies’. This is because the prospective performance of individual buildings could not readily be assessed. In this prescriptive approach buildings are classified into purpose groups according to how they are intended to be used. For any particular purpose group a range of mandated fire safety solutions is set out in prescriptive rules, specifying, for example:

- the minimum periods of fire resistance required for particular parts of the structure;
- the maximum travel distances allowed for adequate means of escape;
- the floor space factors needed to calculate a safe maximum number of occupants (Approved Document B, 2010, Tables 2 (p.33), A2 (p.124), C1 (p.135), and D1 (p.140)).

The job of the regulator is primarily to check that the appropriate rules have been followed for a particular purpose group intended for the construction. To effectively regulate such a prescriptive regime requires the regulator to know what the rules are and, where there is uncertainty, to adjudicate on which rules are applicable and what the rules are intended to achieve.

Prescriptive fire safety regulation remains commonplace in most jurisdictions, but recent decades have seen increasing use of a performance-based design approach, particularly in the UK. This has resulted in the rise of fire safety engineering, a discipline that gives certain advantages when designing buildings. Fire safety engineering looks at fire safety as a whole, allowing more holistic and economic fire safety strategies and solutions that can typically be achieved with strict prescriptive design. The use of fire safety engineering can overcome the inflexibility of prescription and its inability 'to evolve quickly enough to meet the modern challenges of new materials and innovative design' (Christian, 2003, p.1).

The advent of performance-based design has come about due to dissatisfaction with the alleged limitations of prescriptive regulation, including its perceived stifling of innovation, along with the belief that the fundamental knowledge of fire dynamics and structural behaviour has become sufficiently advanced to enable prospective assessment of fire safety. However, this shift raises questions not only about how the desired level of performance is determined, but also about whether regulators have sufficient expertise to adjudicate on whether or not it has actually been achieved by a prospective design (Spinardi, 2016).

A significant challenge for post-construction regulation, and one which is discussed at some length in this thesis, is that what is in effect retrospective regulation (the building is now in use) is carried out mostly by different actors than those involved in pre-construction regulation, and the logic of the building design that was approved (whether according to prescriptive guidelines or on the basis of a performance-based design process) may not be well understood by those post-construction regulators. Moreover, because of the infrequent and probabilistic nature of fire risk, post-construction regulators will only occasionally be able to point to poor performance as evidenced by the occurrence of a fire; more typically, they will judge that the building is unlikely to perform adequately because the material features of the original (approved) design are no longer fully functional, or that the users are operating in a manner that is considered unsafe.

As is described more fully elsewhere in this thesis, UK post-construction fire safety relies heavily on the ability of those regulating (or more often self-regulating) to understand the original fire safety design, and to maintain, and use it properly.

About the next sections

To investigate these issues in a focussed manner, three conceptual lenses will be used to pose specific research questions and structure the arguments. First, the issue of the relationship between the initial approval of a fire safety design and the continuing use of the building will be addressed by discussing the way that technologies are designed with black-boxed knowledge and scripts that envisage their expected use. Second, the implications of the distribution of fire safety knowledge and expertise will be outlined. Finally, the literature on regulatory capture will be surveyed, and the way that recent moves towards deregulation might impact on fire safety will be discussed.

Building design and the black boxing of knowledge

Fire safety design as black boxes

The regulation of fire safety in buildings in the UK is separated into two constituent phases, pre-construction regulation and post-construction regulation. Both phases have different characteristics that have developed because of the nature of the regulated industry, the chosen regulators, and the will of the politicians. There is an intrinsic link between the two constituent phases because the way the building should be occupied safely in the post-construction stage has been determined in the pre-construction stage and is constructed into the fabric of the building. A safe way to occupy any building is presumably to occupy the building as envisaged by the original building designer (or the designer consulted during re-purposing or renovation). The presumption is that occupants of the building will be able to utilise the fire protection methods designed into the building for their intended purpose. This may not be apparent to every occupant of the building, particularly when there are so many other things that may seem more urgent than fire safety. A typical conflict is between fire safety and security. A door that has been provided at the rear of a property as a fire exit may be an ideal location for a burglar to make entry when the building is empty. Following multiple burglaries, but an absence of fires, it may well seem a good idea to block the rear door in such a way that it cannot be opened. The fire safety literature contains several examples of the tragic consequences of this practice when a fire eventually does occur (Pearce, 1986; Rasbash et al., 2004; Purkiss and Long-Yuan, 2014).

The components of the building result from compromises made during the pre-construction design stage. They are the result of the determinations made because of different competing requirements: the necessities resulting from the proposed purpose of the building, the particular configuration of the building site, the needs and locations of other facilities and services in the building such as lifts, water, electricity, and so on, and the requirements of the pre-construction regulator. However, the components necessary for a safe building environment may not be obvious and, as building design develops through innovation and new technology, may become opaque to the individual allotted the responsibility of maintaining them satisfactorily when the building is occupied. The technologies used in achieving an environment safe from fire are thus black-boxed during the design process and can be treated as if their inner workings are invisible. The term black box represents 'an understanding of something entirely in terms of its function' leaving 'on one side the question of what the mechanism is that enables it to perform that function' (Blackburn, 2008, p.41).

This black-boxing of technology is the process of inventing, developing, and packaging a technology until it is predictable and 'looks as though it is the best or only possible solution to its set of problems' (Sismondo, 2004, p.120). The fire safety design fits this description because it has been created specifically to achieve a safe environment in a building in ways that most building users will not understand. The fire safety black box is not self-contained in the way that some black-boxed designs are. For example, an inertial guidance system used on missiles or an aircraft 'does not require input from the outside world to operate' (Mackenzie, 1990, p.26); it reacts automatically, continuously, and independently to its environment, 'made invisible by its own success' (Latour, 1999, p.304). In contrast, a black-boxed fire safety design needs various inputs subject to its design. For example, a sprinkler system needs a supply of water to enable it to operate; a manual fire alarm system needs a manual trigger to activate it; a fire exit that is also a security risk needs security measures to be removed and re-fitted at the start and at the end of the day. Also, a black-boxed fire safety design is an accumulation of other packages of technology, each its own separate black box with its own dependencies, that fit together synergistically to produce the design environment. These separate black boxes include the fire alarm system, the smoke control system, self-closing fire-resisting doors, and so on. Latour (1999, p.183) invites us to envisage this ensemble by reference to a defective projector where 'the repairmen swarm around it, adjusting this lens, tightening that bulb, we remember that the projector is made of several parts, each with its role and function and its relatively independent goals'.

On the part of a building user, if the machinery works efficiently and the output is satisfactory, the focus rests on the quality of the input and not on the complex processes inside the black box. The building users do not necessarily need to understand the complexity inside the black box for the technology to operate successfully. Indeed, in many cases it is easier for the user to remain ignorant of what is inside the black box. In any case, the more complex the processes inside the black box, the more sophisticated the individual has to be to understand how those processes link together and operate (Latour, 1999). The relevant information for the building user is the amount, type, and quality of input needed in order to achieve the desired output. The desired output being a correctly functioning black-boxed fire safety design achieving a safe environment.

Fire safety design scripts

The black-boxed fire safety design is the manifestation of the fire safety knowledge determined by the building designer. The fire safety knowledge embodies the building designer's view of how the building user will use the building because a building, like any other technology, is designed with a user in mind. Decisions made about positions of staircases, lift shafts, types of rooms, etc. are made on behalf of the imagined future user. For this the designer needs a hypothesis about how the user will use the building (Stewart and Williams, 2005) and, in the absence of unassailable information, this may be based on the designer themselves (Oudshoorn et al., 2004). Designing for a user is a reflexive process and the reflexive user, 'the conceptual user resulting from the thought process of the designer anticipating the potential use of his or her design' (Bardini and Horvath, 1995, p.42) may be subconsciously designing the building as she would imagine herself using it (Akrich, 1995).

The user (the building manager) needs information to carry out a specific role in connection with the building's fire safety design if the safe environment envisaged by the building designer is to be supported. The user needs to be able to address the embedded fire safety knowledge in such a way that the equipment, installations, and behaviour of the occupants achieves the building's intended functionality. However, because the fire safety knowledge is black-boxed, the inner working of much of the technology may not be readily obvious or accessible.

Scripts can be described as the final output of the design considerations in respect of the competences, biases, prejudices, and so on, that have been inscribed into the design of the product (Akrich, 1992). Scripting is 'an attempt to predetermine the settings that users are asked to imagine for a particular piece of technology and pre-scriptions (notices, contracts, advice, etc.) that accompany it' (Akrich, 1992, p.208). It compels certain modes of use by the occupier and sets constraints on their future actions (Woolgar, 1991). It suggests that the design and development of a technology involves a process of defining the supposed user (Wade et al., 2016). For example, a well-known fire safety feature that can be found in many, if not all, public, commercial and residential buildings – the self-closing fire-resisting door – is heavily dependent on the design expectations with which it is inscribed.

The script inscribed in a self-closing fire-resisting door delegates the task of maintaining the integrity of a compartment wall. As Latour (1992) wrote in his article on the sociology of the door closer, a door on hinges is a satisfactory way of filling a gap in a wall. Gaps in walls are necessary to allow humans to pass through from one side of the wall to the other. But without a door filling in the gap, there is nothing to keep out the cold or, in the case of a fire-resisting door, to prevent the passage of fire from one compartment to another. Latour (1992) would assert that the compartment wall has been provided with a program and that the success of the program depends on the continuing strength and stability of the wall, and its ability to resist heat and smoke. Breaching the characteristics of the wall is deviating from the original script and could lead to a different outcome from that expected by the designer. Not only is it important that building users do not thwart the intended script of a self-closing door by propping it open (as often happens), but also close supervision of contractors is usually required when installing new equipment involving the passage of pipework or cabling through a compartment wall. All too often such holes provide breaches in the fire resisting properties of the wall, thus also undermining the script designed to support the safe environment. The design concept of the self-closing fire-resisting door can be explicated as:

> To make sure the door is closed at the critical time when the fire occurs, the door will be held shut at all times unless energy is expended to open it. Once the energy used to open the door has been removed, the door will return to its position of being held shut.

The specification for the door closer to achieve the design concept is quite tight as it has to: (1) close the door from any angle of its swing; (2) overcome the pressure of the door latch as it closes against the door frame; (3) hold the door against the door frame contrary to the asymmetry of pressure created by the heat and smoke from a fire acting on one side of the door. The specification can be interpreted as saying:

> I am the nonhuman that swings the door back to its original position and holds it in place when a fire occurs because humans cannot be trusted to do it[16].

Black-boxed technologies that have an embedded script may thus also require a literal script in the form of guidance for their use. Some of the knowledge created during the process of design needs to be provided to the product user. For example, the aviation industry produces a Type Certificate Data Sheet (TCDS) that instructs production engineers how to manufacture aircraft to the approved design. Unless the TCDS is followed sufficiently closely, the chances of producing a safe aircraft on a production line or an aircraft being monitored and maintained correctly during its service are reduced (Downer, 2010). Similarly, in the medicine industry, information sheets containing the knowledge created during the process of clinical trials, critical to how the medicine should

[16] Written in a way that tries to reflect the concept of pre-inscription in *Where are the Missing Masses?* (Latour, 1992).

be stored and what side effects have been observed, are produced to accompany the medicine and inform the users.

The ideal utilisation of the fire safety black box is for it to be accepted, correctly assimilated, and be fully integrated into the management of the building with the correct sustainable input. This would fulfill the expectations of the building designer and ideally bring about the envisaged safe environment.

Research Question 1

> *To what extent does the black-boxing of knowledge in fire safety designs hinder the maintenance and management of post-construction fire safety?*

The Distribution and Application of Fire Safety Knowledge and Expertise

About fire safety knowledge

The fire safety knowledge created during the pre-construction building design stage is the justified true belief[17] of the building design team that the building, if occupied as envisaged, will amount to a sufficiently safe environment in the event of fire. The building design team have constructed their version of reality by compiling facts that they can justify. They have made 'sense out of a new situation by holding justified beliefs and committing to them' using 'feelings and belief systems' of which they may not even be conscious (von Krogh et al., 2000, p.6). Using both tacit and explicit knowledge, they have initiated and formalised their concept of the fire safety features necessary to produce a safe

[17]The tripartite definition of knowledge as justified true belief (or epistemic absolutism) is widely accepted and has been attributed to Plato. However, the concept as espoused by Gettier (1963) and the examples he puts forward in support of the concept have been strongly argued against by Hetherington (2001, Chapter 3).

environment in a virtual world that amounts to no more than a representation of a building by lines on a plan.

In the design of a building, tacit knowledge may be the most important of the different types of differentiated knowledge (for instance, propositional and ability knowledge (Pritchard, 2009), common knowledge and distributed knowledge (Agotnes and Wang, 2017), sticky and leaky knowledge (Brown and Duguid, 2000), and so on). Tacit knowledge is that type of knowledge that enables one to behave in certain ways, innately, without conscious understanding. The tacit knowledge in respect of fire safety, apparent in the process of building design, begins a journey of conversion, transfer, and management that, if successfully achieved, adds to the safety of the building's future occupants.

Tacit knowledge is knowledge which we possess but which we find difficult to explain. It enables us to behave in certain ways: 'Most of us, for example, know perfectly well how to ride a bicycle yet would find it impossible to put into words how we do so' (MacKenzie and Spinardi, 1995, p.45). Similarly, a person who has the expertise to play a piano would struggle to explain how they create pleasing and melodious sounds by pressing the piano keys in a certain manner. Neither the cyclist nor the pianist would have any difficulty in explaining the actions necessary to fulfill the task but that explanation alone would be insufficient to enable another person to ride a bicycle or to play the piano. The skill in either balancing on a bicycle or acquiring the dexterity to play a musical instrument is something that can only be learnt by trial, error, and practice over a period of time. Once learnt, however, the skills will have become internalised as tacit knowledge in the mind of the cyclist or musician but with the warning that this is not necessarily a permanent state: 'Skills, if not practiced, decay. If there is no new generation of practitioners to whom tacit knowledge can be transmitted it may die out altogether' (MacKenzie and Spinardi, 1995, p.46).

Polanyi (1997) describes tacit knowledge using the terms tacit knowing and indwelling. He thought that tacit knowing drew its meaning from the act of indwelling: 'Here we literally dwell in the innumerable muscular acts which contribute to our purpose, and this purpose is their joint meaning' (Polanyi, 1997, p.337). The description of thinking a thought, such as thinking of a word, Polanyi describes as focal awareness but our focal awareness is insufficient for our understanding without a second type of awareness: subsidiary awareness. For example, if we concentrate on a word with our focal awareness, we think of a string of letters that make up the word. The understanding of what the word means is provided by our subsidiary awareness but: 'Subsidiary awareness and focal awareness are mutually exclusive. If a pianist shifts his attention from the piece he is playing to the observation of what he is doing with his fingers while playing it, he gets confused and may have to stop. This happens generally if we switch our focal attention to particulars of which we had previously been aware only in the subsidiary role' (Polanyi, 1958, p.58). This clumsiness can be described as being self-conscious or, perhaps more dramatically, stage fright.

More recent literature on tacit knowledge has diverged from Polanyi's original thoughts on subsidiary and focal awareness, and tacit knowing, and has exploited its derivative, tacit knowledge, largely in support of business. Polanyi's two awarenesses take place in the mind, that is, internalised rather than externalised but the more recent literature investigates the interplay between tacit knowledge and explicit knowledge or, more precisely, the internalised tacit knowledge being converted into the externalised explicit knowledge. It is this interplay that interests the sociologist looking at the creation, transfer, and utilisation of fire safety knowledge.

The whole process of fire safety knowledge creation, conversion, transfer, and utilisation associated with the design, construction, and occupation of a building corresponds to the Model of Dynamic Knowledge Creation, put forward by Nonaka et al. (2000). During the pre-construction design stage of a building, the tacit knowledge of each member of the building design team in their respective discipline is used to progress the task faced by the team. The task facing the building design team is to cooperate in solving the problems posed by the building design while satisfying the requirements demanded by the regulator. Different disciplines involved in building design, in addition to fire safety engineering, can include architectural engineering, structural engineering, electrical engineering, and so on. Their process of cooperation is characterised by negotiation and compromise because each disciplinary representative is focussed on getting the correct deal for their respective discipline. Thus the knowledge embedded in all building design is socially constructed and a unique compromise dependent on, amongst other things, the strength of character, experience, and tacit knowledge of each team member. With regard to the building design, the building design team have tried 'to reorganize and control the world so as to iron out contradiction and ambiguity' (Wynne, 1992, p.299). They are trying to solve the problems that they anticipate will be the problems faced by the future building user. To do this they have to imagine how the future building user will use the building and design measures that will guard against the risks posed by fire from the way the building will be used. In effect, the building design team are setting out a prescripted future for the occupants of the building. Thus, to benefit the greatest amount from the designed safe environment (in respect of fire), the building user must follow the script and use the building exactly as envisaged by the building design team.

However, if the building design team have been wrong in their assumptions, they may have created a situation whereby the building user is having to 'adapt to living with contradictions which are not necessarily within their control to dissolve' (Wynne, 1992, p.299). The buildings user's perspective will only be included so far as the building design team can imagine it, notwithstanding that that imagined perspective has also been the subject of the compromised process of building design. This leads to the situation where those elements of the building design which conflict with the manner in which the building user wants to use the building 'may be legitimately rejected, or at least limited' (Wynne, 1992, p.299).

About expertise

To be considered an expert requires a person to 'acquire at least some necessary domain-specific knowledge and skill' (Ericsson and Lehmann, 2011, pp.488-9). Actors with expertise are necessary in the pre-construction process of building design and regulatory approval to create a safe building. Actors with expertise are also necessary to comply with and enforce post-construction fire safety regulations to maintain that safe environment throughout the building's lifetime.

There is a social element in the definition of expertise, which not only 'highlights the importance of knowledge', but also recognises that 'knowledge is socially created and "carried" by people' (Fincham et al., 2011, p.229). It is not just the ideas embodied in an individual 'but ideas which are embodied in individuals and groups located in specific social, political, and economic contexts' (Fincham et al., 2011, p.229-230). The demonstration of expertise is also dependent on the ability of the group to conform to whatever political rules or regulations apply to the discipline or field associated with the expertise.

Thus the expertise required of a building designer is not just the knowledge and experience required to design a compliant building, it also includes the ability to demonstrate the compliance to gain approval of the design. Likewise, the expertise of a building manager is not just the ability to adapt the building and its occupants to suit the business process, it includes the ability to produce a safe environment by identifying new hazards and introducing measures in the management system to exclude, reduce, or control them.

Certain social behaviours are associated with and characterise expertise. An expert has the ability to analyse situations by diagnosis and to not only understand the problems associated with that particular situation but also to understand the factors that have led up to that particular combination of circumstances. An expert can accurately anticipate what will happen next if the situation is not resolved and can then determine, in some detail, what the next steps should be to resolve the situation. An expert is able to strategise and produce new solutions to avoid the same combination of circumstances arising again, including the ability to cooperate with other actors to achieve that aim (Evans, 2011).

Collins and Evans (2007, Table 1, p.14) coined the term *beer mat knowledge* as one component of their Periodic table of Expertises. The different types of knowledge matter in fire safety because there is a degree of competence needed to carry out tasks such as a fire risk assessment correctly. Knowledge is a component of competence (other components include skill and experience) and without the correct degree of competence, the fire risk assessment may be conjecture, and thus worthless. Beer mat knowledge is the kind of knowledge that can be gleaned from reading detailed information simply put. It allows an individual to gain some knowledge without gaining a full understanding. The insight originates from a beer mat seen in 1985 that explained the essence of a hologram in four sentences. Anyone reading and memorising the four sentences would feel able to give an affirmative answer to the question: what is a hologram? However, 'the explanation on the beer mat does not enable the naive reader to do anything such as make a hologram, or debate the nature of holograms, or to correct anyone's mistakes about the nature of holograms, or to make a sensible decision about the long-term dangers associated with the unrestrained spread of holograms, or convey any information about holograms other than the formula itself' (Collins and Evans, 2007, p.19). This type of expertise lacks necessary tacit knowledge and clearly has limited application. We thus need to assess whether an individual possessing beer-mat knowledge of fire safety would be sufficiently competent to carry out a satisfactory fire risk assessment on a building, and if not, whether adequate mechanisms are in place to ensure a greater level of knowledge.

Expertise one step up from beer mat knowledge is what Collins and Evans (2007) term the *popular understanding of science*. This is the kind of knowledge that 'can be gained by gathering information about a scientific field from the mass media and popular books' (Collins and Evans, 2007, p.19). This category of expertise does not involve the greater detail of the tacit knowledge of those with real expertise in the particular field but it would enable an individual to pass on knowledge to another individual as a set of ideas rather than a set of formulae. This type of expertise may lead to misplaced confidence in knowledge claims as captured in the phrase 'distance lends enchantment' (Campbell, 1820, p.11). In the context of expertise it can be interpreted as meaning that someone with a popular understanding of science can fail to 'discern the complexities which lead scientists to be cautious in making claims' (Collins and Evans, 2007, p.6). An individual possessing a popular understanding of fire safety would have more comprehension of the principles of fire risk assessment and would have a better appreciation of how the principles fit together when evaluating fire risk. They might be able to carry out a competent fire risk assessment in a simple building, but the risk would be that they would fail to be aware of their own limitations. It is certainly doubtful that they could be trusted to carry out an adequate risk assessment on a building that relied on more complex fire safety systems (such as smoke control).

Another category of expertise is that of an individual with access to primary source knowledge. The internet, for example, is a vast resource of easily obtained technical knowledge that, because it can be hard to read and understand, 'gives the impression that real technical mastery is being achieved' (Collins and Evans, 2007, p.22). However, the informed patient that visits their doctor armed with internet research into their particular medical condition suffers from the lack of social interaction with other experts in the field. An authority in the field, socialising with other experts, knows the value of the relevant literature and is able to assess which writing should be given more weight than another. Just reading the primary source literature 'can give a false impression of the content of the science as well as the level of certainty' (Collins and Evans, 2007, p.22). We would thus expect that this form of knowledge would also be insufficient to enable an adequate fire risk assessment for buildings with complex fire safety solutions, though it might form the basis for a check-list that would be useful for a simple building.

However, although access to primary source information of fire safety is considered to give an individual a higher level of fire safety knowledge than an individual possessing a popular understanding of fire safety science or technology or one with beer-mat knowledge, this does not necessarily mean that they would be better equipped to carry out a fire risk assessment. Without the necessary tacit knowledge that can come from spending time in the company of fire safety practitioners, a deep understanding of the issues discussed in primary source information may be unavailable. This, coupled with the lack of experience in dealing with the variety of different building occupancies, building designs, and different business processes, may place an individual with access to primary source information at the same level as someone with a popular understanding of fire safety science or technology.

According to Collins and Evans (2007) gaining a higher degree of expertise depends on the acquisition of tacit knowledge of a topic. Tacit knowledge is knowledge passed on from one person to another by observation, practice, and experience. It is how a language is learnt, it is how an individual learns to swim, it is the enabler for an individual to learn to play a musical instrument. One feature of the process is that it is extremely difficult to visualise and explicate the knowledge by writing it down. Tacit knowledge seems ‘to involve normative, intentionally directed activities that might readily be characterized in terms of knowledge, but at the same time might seem to involve something that cannot be (at least fully) put into words’ (Gascoigne and Thornton, 2013, p.3).

Tacit knowledge can be acquired by interacting with a specific way of life or being immersed into a domain of knowledge, thus producing a deep understanding that can be practically expressed as ‘what you can do rather than what you can calculate or learn’ (Collins and Evans, 2007, p.23). The experience of interaction or immersion engenders tacit knowledge, with sufficient interaction or immersion leading to ‘specialist tacit knowledge’ (Collins and Evans, 2007, p.23). Someone with specialist tacit knowledge can be said to have mastered an expertise.

Specialist tacit knowledge can be broken down into two kinds: 1) contributory expertise; and 2) interactional expertise. Contributory expertise consists of a five stage hierarchy applicable to the learning of a skill such as learning how to drive a motor vehicle. The five stages are described as: novice, advanced beginner, competence, proficiency, and expertise (Collins and Evans, 2007, pp.24-5)[18]. As a novice driver tackles each stage, improving her skill and mastering it, so she moves up the hierarchy of stages.

Interactional expertise differs from contributory expertise because it is expertise in the theory of the expertise rather than the practice of the expertise. This can be explained using the subject of learning a language as an example. By comparing two individuals from two different cultures, say, an English person brought up in England and a French person brought up in France. The English person has contributory expertise through learning to speak the English language by being brought up in an English-speaking family. This English person has also learnt how to speak the French language. She can speak French well but she cannot be said to have contributory expertise in the French language because she has not been immersed in the French culture. So she is said to have interactional expertise in the French language. Conversely, the French person who has learnt the English language is the exact opposite possessing contributory expertise in French but only interactional expertise in English. As another example, the analogy may perhaps be applied to a sociologist studying scientists. Although the sociologist mixes with the scientists and gains a deep understanding of the science, she can only gain interactional expertise because she does not participate in the science (Collins and Evans, 2007, p.28).

Tacit knowledge has always been important in the regulation of fire safety. When the mid-20th century UK Government decided that the regulation of fire

[18]The five stages of expertise put forward by Collins and Evans (2007, pp.24-5) can be divided further and split into seven stages. These can be applied to the craft guilds of the middle ages as considered by Hoffman (1998, pp.84-5).

safety should be in the hands of the local authorities, they also provided that the local authorities should take advice from the fire authorities. This was because of the perception that fire officers were in possession of tacit knowledge about fire safety that was not available to the local authorities. The Government's resolve in support of this determination appeared to be vindicated when the Holroyd Report agreed that 'only men with practical fire-fighting experience can properly assess the adequacy of the fire prevention provisions made in particular premises, since only they have an adequate knowledge of what constitutes the chief fire dangers, the way in which fire is likely to behave in the particular circumstances of the occupancy and the likely reaction in a fire of people in the building' (Holroyd, 1970, para.383, p.164).

The value of the firefighters tacit knowledge for assessing the fire safety of buildings was not challenged for many years. It has only been confronted and seriously challenged latterly by the many actors who have joined the fire industry after their own arduous training in fire safety. If competence is where a person 'has sufficient training and experience or knowledge and other qualities' (Regulatory Reform (Fire Safety) Order, 2005, s.18(5)), or has 'the ability to undertake responsibilities and perform activities to a recognised standard on a regular basis' (Managing for Health and Safety, 2013, p.17), the most competent actor would probably be a fire safety officer who has experience in operational firefighting, who holds a degree in fire safety engineering, who has trained and practised as a fire safety enforcement officer, and officiated as a consultant to building control, having carried out these roles for many years on a regular basis.

The appropriate expertise, however, would be related to the particular building and/or the particular business process and it could be that a fire safety practitioner is considered to have the appropriate expertise for one building but not for another. The expertise considered adequate for dealing with an office or a shop may not be considered adequate for dealing with a residential care home or a hospital. This means that there is probably a continuum of expertise for each category of building/business process and the expertise considered adequate on one continuum may not be appropriate for another.

About competency

The critical matters of expertise and epistemic authority in the production and utilisation of fire safety knowledge hinge on what mechanisms are in place (if any) to ensure that key actors, such as fire risk assessors, are competent. For instance, to what extent are fire risk assessors members of organisations or professional bodies that set appropriate standards of competence? Or, for that matter, to what extent are the existing organisations and professional organisations competent to set appropriate standards?

There are precedents that deal with competence in other inherently hazardous industries. For example, similar safety concerns to those encountered in fire safety are present within the domestic gas industry. The individual who fits our gas appliance (just like the fire risk assessor) must be sufficiently competent to enable us to enjoy a safe environment when the task has been completed. However, that is where the comparison ends because as an indication of their ability, and as a means of control over their competence, all gas fitters whose work involves the connection of gas appliances have to be registered on a scheme called the Gas Safe Register (see Wade et al. (2016))[19].

An important issue for post-construction fire safety is the extent to which any similar schemes for fire risk assessors provide any assurance that a fire risk

[19] Source: Designing Buildings Wiki at https://www.designingbuildings.co.uk/wiki/Gas_Safe (accessed on 28 June 2017).

assessor has sufficient competence can carry out a fire risk assessment. What such schemes exist and how do they operate? What systems do they have with regards to transparency, and how do they provide oversight or monitoring of their performance. What role does Government and/or other institutions involved in the fire safety industry play in supporting such schemes?

Research Question 2

> *How is fire safety expertise distributed amongst the key actors in post-construction fire safety and how is competence regulated?*

Deregulation, Self-regulation, and Regulatory Capture

For credible as well as effective regulation, regulators need to be competent and to have the appropriate expertise. Regulators also need to be independent in their pursuit of maintaining the legal requirements of their regulatory role without being compromised by their relationship with the regulated industry.

Deregulation and self-regulation

As noted earlier, because technologies typically involve risks as well as benefits societies have long had in place systems of regulation. In the case of buildings, fire safety regulation in the UK has evolved to comprise two separate stages, pre- and post-construction. One of the key issues with regard to this regulation concerns where responsibility lies for carrying out these regulatory activities. Traditional regulation has typically been implemented and enforced by Government, but increasing deregulation in the late Twentieth century has in many areas shifted responsibility for regulation away from Government and towards industry.

Traditional regulation has been described as ‘the employment of legal instruments for the implementation of socio-economic policy’ (den Hertog, 2000, p.223). Legal instruments are seen as useful because they can be used to compel a regulated industry to comply by the threat of penalties or sanctions as a last resort. Sanctions available to the regulator ‘can include fines, the publicizing of violations, imprisonment, an order to make specific arrangements, an injunction against withholding certain actions, or closing down the business’ (den Hertog, 2000, p.223). The intention of regulation is to provide a solution for a situation that has become dangerous, unfair or unjust, and where the allocation of goods, the efficiency of a service, or the behaviour of individuals or organisations in a social system is understood to be failing. The process in respect of goods and services is usually perceived in terms of economics where the role of regulation is to provide a better balance and prevent the failure of the respective market.

Inevitably, politics plays a part in the introduction of regulation. How society perceives the burden that may be imposed, or the satisfaction that may be enjoyed from a new regulation has a bearing on the nature of regulation introduced. The perception of society to a new regulation is critical in a democracy where the government wants both to balance the social or economic harm being done because of poor, or no, regulation, against the prospects of its re-election. There are always costs and benefits to regulation but who pays and who benefits is important: ‘people take into account not only who benefits but also whether it is legitimate for that group to benefit’ (Wilson and Dilulio, 2008, p.468). Wilson (1984) suggested some distinct groups that reflected the characteristics about the way society perceives the effects of regulation. The politics surrounding societal items that we all depend on and are paid for by almost everyone are referred to as ‘majoritarian’. These include, military defence, research into cancer, the UK's National Health Service, and so on. The reverse of majoritarian politics is labelled as 'interest group politics' where only one small group benefits but the cost is borne by another small group rather than the rest of society. Whereas there is no organised group in majoritarian politics, competing sides are organised in interest group politics. This makes the interest groups competitive and is a characteristic of a healthy democracy. Examples of interest groups are primarily organisations with the motivation, expertise, and resources to lobby the relevant authorities, such as, trade and professional associations, animal welfare groups, environmental groups, and so on. However, the competitiveness of interest groups raises a dichotomy; is it really a sign that democratic choice is being exercised or does it, perhaps, mean that democratic choice is being stifled by lobby groups with the most wealthy supporters?

Perhaps the political assemblage to attract the most attention is labelled as 'client politics', characterised as where a small group benefits disproportionately to the expense of the many, or 'a political situation in which a small, relatively homogeneous beneficiary group can make substantial gains by imposing unobtrusive costs on large numbers of others' (Wilson, 1984, p.87). Tariffs on imported goods is an example of client politics: tariffs are the compulsory contribution that importers of goods have to pay before the goods can enter the country to be bought and sold. The idea of the tariff is to make imported goods more expensive than home-produced goods.

The reverse of client politics is referred to as 'entrepreneurial politics' where the many benefit but only a small group pays the cost (Wilson, 1984). An example of entrepreneurial politics is anti-pollution regulation which benefits everyone but is paid for by the polluting companies.

The type of regulation chosen by a Government is the result of political reasoning that will normally reflect the ruling body's point of view, usually one which the politicians think concurs with the manifesto upon which they came to power. In a democracy, it is important how the effect of the regulation is perceived by society as that will have a bearing on the continued political support of the Government. A key feature of recent decades, particularly in the UK and USA, has been the rise of neoliberal economic policies that favour deregulation of industry. At the heart of neo-liberalism, that became mainstream in the 1980s with the Regan and Thatcher Governments in the US and UK, was 'the idea that pro-business deregulation was not merely in the commercial interests of industry, but ultimately for the greater good' (Davis and Abraham, 2013, p.6). An example of this is reflected in the current UK fire safety regulations which were introduced as part of a package of regulatory reform reflecting the Government's political approach to regulation. The intention was to boost business enterprise and growth by 'reforming legislation which has the effect of imposing burdens' on business (Regulatory Reform Act, 2001, s.1(1)). Michael Heseltine[20] in a 1981 Command Paper on *The Future of Building Control in England & Wales* set out key objectives of 'maximum self-regulation' and 'minimum Government interference' (HMSO, 1981, p.4). The initial legislation in the 1980s led to introduction of functional requirements for building control in England and Wales, thus enabling the use of performance-based approval of fire safety designs. This concept was introduced to post-construction legislation, in part, in 1997[21] and then comprehensively with the introduction of the Regulatory Reform (Fire Safety) Order (2005). This reform

[20]Michael Heseltine was Secretary of State for the Environment in the British Government from 1979 to 1983.

[21]The Fire Precautions (Workplace) Regulations (1997) initiated the UK Government's attempt to implement European Directives in respect of fire safety. This legislation was amended by the Fire Precautions (Workplace) (Amendment) Regulations (1999) which, along with the Fire Precautions Act (1971), was repealed on the introduction of the Regulatory Reform (Fire Safety) Order (2005).

of post-construction regulation of fire safety shifted the onus of checking the fire safety of many buildings from the fire services to the building users (typically employers or owners). Taken together, this deregulation meant, in effect, greater scope for self-regulation.

Regulation can take many forms and there exists a broad range of different types of regulation along a spectrum between no regulation at one extremity and fully enforced regulation at the other. Bartle and Vass (2005) suggest that the regulatory categories of self-regulation and co-regulation (that is to say, regulated self-regulation) lie at different points along this spectrum, their exact points demonstrating the differences in their characteristics. Self-regulation, nearer to no regulation, indicates a lesser level of government intervention but may need a higher level of expertise, on the part of the self-regulator, than would co-regulation. In contrast, co-regulation, being nearer to fully enforced regulation, indicates a higher level of government intervention but consequently may not require the same level of expertise as self-regulation. The characteristic differences are concerned with the expertise needed by who it is that specifies, administers, and enforces the regulations. The position on the spectrum suggests a level of trust on the part of Government and that level equates with the amount of expertise within, or available to, the regulated industry. The amount of expertise should be sufficient to deal with the potential risk involved in that industry in consideration of how that risk is identified. The risk could be the correct functioning of the market, the safety of individuals in a social group, the risk that the Government could be affected adversely in terms of politics, and so on.

The dichotomy between prescriptive and performance based regulation (discussed earlier in this chapter) has significance for the way that regulatory oversight operates. Prescriptive standards tend to be a way of either restating previous standards or of codifying the results of experience. However, in modern innovative industries this methodology can be erroneous and even dangerous where, '[i]t is the innovator that is best placed to ensure the safety of their design, not the regulator' (Penny et al., 2001, p.35). Although the standard may have embodied the best practice of the industry at the time they were written, new technology and innovation may have overtaken this. Even worse, the codification of contemporaneous best practice may be preventing the development of a newer safer environment. Reliance on prescriptive standards can thus lead a situation where actors follow the letter of the law, rather than the spirit of the law, with the result that 'safety is viewed as a responsibility of the regulator and not the service provider whose responsibility, in law, it actually is' (Penny et al., 2001, p.35).

In contrast, the performance-based approach offers a higher level of flexibility by focusing on the outcomes rather than the means of achieving the outcomes. Technological change and innovation can be easily accommodated but, as noted in section 2.1.1, the challenge is in measuring whether new methods of achieving the outcomes have actually achieved them (Coglianese et al., 2003). Performance-based regulation can thus be seen to favour the larger companies in the regulated industry because they have the more capacity to innovate while being be beyond the budgets of smaller firms. Smaller companies 'may simply prefer to be told exactly what to do, rather than incur costs to identify steps needed to achieve a performance standard' (Coglianese et al., 2002, p.7). But if the regulatory authorities or trade associations introduce codes of practice that, if followed precisely, would mean that the standard is being met, ironically, this means that a performance-based approach has effectively taken the form of the prescriptive approach it replaced (Coglianese et al., 2003).

Self-regulation is concerned with embodying a model of self-control that needs an adeptness in its application and a determination to keep the rules in that application. Self-regulation has the potential to be less expensive, using fewer resources, and to use more effectively the knowledge and expertise of all parties. It has a number of advantages as well as disadvantages, for instance, the knowledge and expertise needed for competent regulation may also make self-regulators more adept at acting in their own interest rather than the interest of society. Self-regulation, particularly performance-based self-regulation, can be more flexible and adaptable in its application suggesting that the more innovative the application the lower the burden of regulation on business. This may mean, however, that self-regulators do not focus on their statutory objectives nor aspire to the full intent of the regulations. Self-regulation can engender more commitment, more pride, and more loyalty within the regulated industry but motivators such as this could operate to the detriment of a satisfactory system of transparency or public accountability (Bartle and Vass, 2005).

Self-regulation must include accountability and, if the competence or the motivation of the self-regulator is in doubt, the self-regulation will lack credibility. Unless the self-regulator is sufficiently motivated or rigorously enforced by the regulator, the performance of self-regulation may suffer. Sufficient regulatory performance may be carried out during good conditions but that performance may be gradually ignored as other factors come into play. For example, external economical conditions may worsen causing less management attention to be paid to matters affecting health and safety resulting in a gradual reduction in the application of the regulations. As the level of application is reduced, over time the new level will become normalised potentially to the detriment of the occupants of buildings who have little control over their environment (Vaughan, 1996; Stollard, 2014).

In their study of the motion picture industry, Waguespack and Sorenson (2010) found that self-regulation in respect of the film classification system was being manipulated and was stratifying the industry. The stratification represented an asymmetry in the ratings that classify films and was allowing the more powerful, influential film studios to erect ‘barriers that impeded independents and lower status participants from offering appealing products in the most profitable niches’ (Waguespack and Sorenson, 2010, p.26). The more powerful film studios were able to manipulate the film certification system to make sure the films they produced enjoyed a competitive advantage over the small independent film distributors.

Howard et al. (2000) in their study of environmental regulations also found that self-regulation of companies produced effects that indicated manipulation by companies in the regulated industry suggesting that self-regulation was being used to favour the regulated industries themselves. Performance-based codes had been put forward by the Chemical Manufacturers’ Association to restore public confidence in the operations of chemical companies following disasters such as Bhopal (Shrivastava, 1987) and Seveso (Kirchsteiger et al., 1998). The codes were designed to inform companies of the correct behaviour but gave discretion in how the companies should adopt the behaviour. In particular, the codes were the industries’ attempt to generate substantive change in corporate practices to generate a culture of health and safety resulting in a safe environment. The codes also urged companies to adopt a policy of openness with the local communities in which the chemical companies were located. However, the study found that self-regulation coupled with a lack of strong external sanctions were allowing companies to create a smokescreen that facilitated non-compliance with the codes. The codes were being used to manipulate and ‘elicit the greatest and most uniform response in companies in areas visible to outsiders' (Howard et al., 2000, p.77) thus giving a false impression to an observer.

The same approach was reflected in the way forward suggested for the chemical industry following the outcome of the inquiry into the incident at Buncefield, Hertfordshire in 2005 (COMAH, 2011). The inquiry thought that what was necessary was for the chemical industry and the regulators to be 'aligned but not joined' (BSTG, 2007, p.5). The expression *aligned but not joined* was meant to describe the relationship between the industry and its regulators that accounted for their differences in expertise but could work to make mutually beneficial improvements. The proposition in the expression is that there is little difference between the manufacture of chemicals in the chemical industry and the need to regulate for a safe environment. Regulation cannot be effective without the detailed knowledge available in the industry and the detailed knowledge within the industry is necessary to make the industry safe and secure. Aligned but not joined also supports the use of performance-based regulation as it suggests an adult-to-adult transactional relationship between industry and regulator rather than the parent-to-child relationship present in prescriptive regulation (Berne, 1964).

Self-regulation is not only dependent on the ability of self-management, possession of the appropriate knowledge, and a sense of personal awareness and agency, it is also prey to conflicts of interest, bias, and the limits of personal capacities. These shortcomings can be problematic, affecting the outcome of the regulations by resulting in an outcome that is favourable to the self-regulator but detrimental to the intent of the regulations. Lord Justice Leveson objected to the proposal for an independent system of press self-regulation during his inquiry into the behaviour of the press because he thought that the potential self-serving nature of the proposal would be detrimental to justice.

The proposal suggested that the pool from which the panel of self-regulators was to be drawn would be 'limited to no more than 20 or so' editors of national newspapers. This he thought was unacceptable commenting that it amounted to no more than self-regulators 'marking their own homework' (Leveson, 2012, Volume IV, Part K, para.8.6, p.1682).

The assertion of a self-serving bias is a known tendency in society. 'For example, in experiments where people are allowed to succeed or to fail, independent of their own actions, subjects reliably attribute success to their own efforts and failure to things other than themselves' (Vitz, 1994, p.20). The quote illustrates both the positive and the negative aspect of the bias, the positive attribution of success to oneself, and the negative aspect of failure to someone or something else. An example of this is the difficulty of reaching agreement on what constitutes a fair sharing of measures to reduce damaging emissions in the debate about climate change. Agreement of a solution to climate change inevitably means an amount of self-sacrifice amongst the most influential nations and the perception of what constitutes fairness means that 'there is often no settlement upon which all parties will agree, even when large joint gains are available from agreement' (Kriss et al., 2011, p.603).

Optimism can be another drawback because an inexperienced self-regulator may tend to be too optimistic in her appraisal of a risk assessment. After all, 'we underrate our chances of getting divorced, being in a car accident, or suffering from cancer. We also expect to live longer than objective measures would warrant, overestimate our success in the job market, and believe that our children will be especially talented' (Sharot, 2011, p.R941). It is not surprising that we are too optimistic when, for example, we are considering ambiguities that need hidden amounts of knowledge and experience to answer. Ambiguities such as, the length of time we will have available for evacuation of a building in the event of a fire, or whether we will remember to re-close the self-closing fire-resisting door after we have wedged it open to allow air to circulate on a warm day.

A sense of optimism does not necessarily indicate or include rationality yet the manner in which we make plans, create regulations, or carry out risk assessments, usually adheres to a rational model (Kelly and Palumbo, 1992). An adequately competent self-regulator carrying out a fire risk assessment will understand the need to turn objectives into actions by, for example, focusing on fewer more urgent priorities to yield the best results. However, the natural step-by-step incremental approach of rational planning coupled with the need for specific knowledge and expertise does not secure guaranteed success (Starling, 2010). Unless, through training and experience they are challenged, many natural inherent biases may become involved and decisions will be subject to satisficing or a decision that works with no particular reason to think it is the best one (Blackburn, 2016).

Our propensity to satisfice is just one of our biases, another popular bias is the availability bias. This is where the availability of information influences and distorts our perception of risk, encouraging us to ignore the larger risks in favour of worrying about the smaller risks. Some academics blame the media as they are the purveyors of large quantities of easily comprehended information: 'People tend to assess the relative importance of issues by the ease with which they are retrieved from memory–and this is largely determined by the extent of coverage in the media. Frequently mentioned topics populate the mind even as others slip away from awareness. In turn, what the media choose to report corresponds to their view of what is currently on the public's mind' (Kahneman, 2011, p.8-9).

About regulatory capture

Regulatory capture theory infers that ‘politicians and regulators end up being “captured” by special interests, usually the producers they are intended to regulate. As a result, laws and regulations serve not the public interest, but those special interests’ (Dudley and Brito, 2012, p.15). Stigler (1971, p.3) suggested that ‘as a rule, regulation is acquired by the industry and is designed and operated primarily for its benefit’ but this is not so surprising with the consideration that ‘individuals in government (politicians, regulators, voters, etc.) are driven by self-interest’ (Dudley and Brito, 2012, p.17). Both politicians and regulators could easily be using their societal positions to ignore the public interest in order to increase their own. The relationship between industry and the regulator can be manipulated to favour industry. The regulator is only human and industry can work to find ways in which it can get close to the regulator. As a result, the regulator may be subject to bribery or being rewarded for turning a blind eye. It has also been argued that regulators have a natural cycle, whereby initially they ‘tend to be adversarial towards industry but become isolated as their enthusiastic staff tire and retire. Eventually they are progressively “captured” by, and come to share the perspectives of, the industries they are supposed to regulate’ (Abraham, 2008, p.873).

Capturing is shorthand for regulated industries securing favourable outcomes at the expense of the public (Bagley, 2010), and one way in which that happens has become known as the revolving door. The term *revolving door* is a metaphor for the movement of individuals between a position in a regulatory body and a job in the regulated industry, and vice versa. An individual’s career path can alternate between the regulated industry and the regulator and can result in distinct forms of regulatory capture such as: ‘identification with the industry, sympathy with the particular problems that regulated firms confront in meeting standards, and absence of toughness' (Makkai and Braithwaite, 1992, p.61). Identifying with and having sympathy for the industry can typically be predicted in individuals who have ambitions to move into the regulated industry but this can also be identified in regulators who tend to be less onerous in their enforcement.

Consider, for example, a firefighter becoming a fire safety enforcement officer and spending much of their career applying fire safety regulations. On retirement from the fire and rescue service, aided by their competence and experience in enforcing regulations, it would not be unusual for them to be offered a lucrative position as a fire safety consultant. Their specialist expertise could be utilised in overcoming the problems associated with the approval of building designs by the regulator. There is nothing inherently wrong with this but it has the potential to create an unhealthy relationship 'between the private industry and the government, based on the granting of unearned economic benefits to the detriment of the general public interest' (Panagia, 2015, Note 2, p.28). Aside from the detrimental effects to the public interest, there are other problems that have become associated with this type of career move. The lucrative position gained by a former regulator could have been due to cronyism or to them ingratiating themselves by being overly sympathetic towards regulatory approvals. Also the position could lead to the use of confidential or personal information to intimidate former colleagues in order to benefit their new employers (David-Barrett, 2012).

Two versions of regulatory capture theory at a global scale exist; one theory posits that, globally, regulatory capture theory exists on a grand scale. The groups that have largely set the rules on this global game are special interest groups within the larger industrial countries. They maintain their success by displaying little interest in setting rules that are fair and equitable for all countries, whether rich or poor. This is because they are so powerful that they can resist any attempt at reform (Mattli and Woods, 2009). However, an alternative theory suggests a more optimistic view. This is that rather than just benefitting the larger industrial nations by maintaining an unequal playing field, 'global regulation helps to break down inefficient and discriminatory domestic regulatory schemes as well as old-fashioned value systems subserviant to the interests of corrupt national elites' (Mattli and Woods, 2009, p.1). This may be because global analysts and economists fail to realise the full scope of local corruption in many countries where 'far too many bureaucrats impose senseless restrictions just to collect bribes or to exercise power' (Bhagwati, 2004, p.58). Thus allowing a more organised environment in which markets can operate more freely.

Concerns about regulatory capture have become heightened in recent decades by the deliberate moves by many governments to reduce what is seen as the burden of regulation in a neo-liberalist environment (Bolick, 1995; Harvey, 2005).

A claim of regulatory capture can be argued if sufficient evidence is found surrounding the regulation in question when compared against three general empirical standards offered by Carpenter and Moss (2014, p.15). That is to say, (1) if a defeasible model of the public interest can be provided; (2) if a policy shift away from the public interest toward the interest of the regulated industry can be shown; and (3) if sufficiently effective action and intent by the industry in pursuit of the policy shift can be shown to have caused an appreciable part of the shift. Robust evidence, sufficient to suggest a strong capture, could show that the regulation 'violates the public interest to such an extent that the public would be better served by either (a) no regulation of the activity in question—

because the benefits of regulation are outweighed by the costs of capture, or (b) comprehensive replacement of the policy and agency in question' (Carpenter and Moss, 2014, p.12). Less convincing evidence, sufficient to suggest a weak capture, does not necessarily infer that no regulation is better if the public interest is still being served. Although the net benefits of regulation may be reduced, the regulation may still be positive overall.

Research Question 3

> *Has deregulation of UK post-construction fire safety led to regulatory capture and, if so, to what extent, and in what form?*

Methodology

Introduction

Building fires are fortunately rare but this fact alone serves to maintain the mystery surrounding fires in buildings and elevates in the public consciousness those that through qualifications and experience profess to understand its principles. Some actors in the fire industry capitalise on the mystery although the majority fully comprehend their duty to exercise their competence soberly in a way that benefits the general public. These are the actors that have been sought out in the course of this study and who have provided data for analysis in this thesis.

The overall approach taken for the research design was historical sociology, an approach that draws on a historical perspective when investigating contemporary society (Mackenzie, 1990, 2001; Subrt, 2017). A historical sociology approach provides the historical context to understand why and how fire safety regulations have changed, thus avoiding a static snapshot that focusses only on the situation at a particular point in time. This historical approach enables us to observe changes that offer insights: 'Those of us who research social processes are seldom able to set up our own experiments. We have to wait for the world to do it for us. The passage of time, and changes it brings in the factors and phenomena that interest us, are our single best resource' (Mackenzie, 1990, p.7).

This methodology was commenced by the use of description, in which the subject of study is explored whilst gathering information using personal interviews, and observation to explain it. Descriptive research asks the relevant questions to establish what is going on. The 'method is used to discover facts on which professional judgement could be based. It involves the description, recording, analysis and interpretation of what it is' (Rivera and Rivera, 2007, p.56). Research that successfully answers the question, 'what is going on?', leads on in a sequential manner to explain and establish, 'why is it going on?' The two methods complement each other such that the subject of study can only be satisfactorily researched if it has been thoroughly explored and explained.

Data used in the thesis is the result of a mixed research methodology which has the effect of offsetting the weaknesses of the different methods of research included. Weaknesses can include the difficulty of incorporating the context of societal behaviour when analysing quantitative data and generalising from an individual to a large group when interpreting and analysing biased qualitative data. Mixed research can be complex making it difficult to draw out the relationships between two different types of research to resolve any discrepancies but it can provide a more comprehensive understanding of the subject of study. Mixed research methodology employs multiple methods of observation 'because each method reveals different aspects of empirical reality' (Denzin, 1970, p.26).

Of the two types of strategy used to reach a conclusion when analysing data, the inference from inductive reasoning can offer a best explanation of the data, a logical and plausible interpretation, based on specific examples and previous cases. As Blaikie (2010, p.18) explains, inductive research 'starts with the collection of data and then proceeds to derive generalizations using some kind of inductive logic'. Hume (1768, p.18) drew attention to the value of data collected from the results of observation, experimentation, and past experience when he suggested that: 'From causes which appear similar we expect similar effects. This is the sum of our experimental conclusions'. Conversely, deductive reasoning argues that a conclusion is true because the premises of the argument are true but inductive reasoning differs because the veracity of the logical conclusion of its arguments is based on the strength of the evidence analysed. Simply put, it becomes a probability that the better the evidence gathered and analysed, the more likely the inference is to be accurate.

The qualitative and quantitative data used in this thesis has been collected separately but concurrently, interpreted, and, along with the use of case studies, has been synthesised in the analysis to support the theoretical thrust of the thesis. The process involves the logic of triangulation, a method of informing the research with a wide scope of fruitful and robust data, contributing to the rigour of the research, while allowing a deeper understanding of the subject of study. Using the method of triangulation also aids in the corroboration of the research as it ‘implies that the results of an investigation employing a method associated with one research strategy are cross-checked against the results of using a method associated with the other research strategy’ (Bryman, 2012, p.635). This is not to say, however, that mixed research methodology cannot make the research more complex while consuming more time and more resources. More importantly and in pursuit of credibility, although the use of quantitative and qualitative data undermines the impermeable boundaries between those two methods it can, nevertheless, treat ‘the distinction between quantitative and qualitative methods as if it were more uniform, stable, and meaningful than it is’ (Hammersley, 2008, p.32).

The use of document analysis, the systematic procedure necessary for reviewing potentially relevant documents, is an effective component of triangulation. The mixture of qualitative and quantitative data, the conclusions from semi-structured interviews, informed by the results of an analysis of relevant documents can serve to ‘reduce the impact of potential biases that can exist in a single study' (Bowen, 2009, p.28). 'Document analysis refers to an integrated and conceptually informed method, procedure, and technique for locating, identifying, retrieving, and analyzing documents for their relevance, significance, and meaning' (Altheide, 1996, p.2). Document analysis has both advantages and disadvantages when compared with other qualitative research methods. It can be more efficient because data has already been gathered, documented, and is easily accessed via the internet. Authors, by their use of references, can also offer leads to similar work of other researchers facilitating a more balanced view of the subject. But, unless the document has been subject to a peer-review process, it can be difficult to discover the author's biased influence without studying more work from the author herself. This exposes another limitation because, without preferential access, the cost-effectiveness of analysing many documents can prove restrictive (Bowen, 2009).

Who participated in the research?

The study involves primary data captured by qualitative semi-structured interviews of actors chosen mainly from four professions essential to the regulation of post-construction fire safety: the fire safety engineer, the fire safety manager, the fire risk assessor, and the fire safety enforcement officer. The semi-structured interview is an effective method of obtaining qualitative data and is different from the structured interview which is an effective method of obtaining quantitative data. The structured interview focusses on the measurement of key concepts derived from specific research questions. Whereas, the semi-structured interview demonstrates 'much greater interest in the interviewee's point of view' and less interest in the researcher's concerns (Bryman, 2012, p.470).

Because documents alone do not provide in-depth data on many aspects of fire safety regulation, interviews comprised a key methodological tool for this research. The thesis is concerned with the sociological activities of actors involved in the post-construction regulation of fire safety in buildings but there is a relationship between the pre- and post-construction regulation of fire safety that cannot be ignored. The effectiveness of the post-construction environment is heavily dependent on the effectiveness of the pre-construction regulation, specifically, the influence and impact of the fire safety building design determined by pre-construction actors. This made it necessary to engage with actors in both pre- and post-construction stages.

The pre-construction actors are key to the creation of fire safety knowledge which is established during the pre-construction part of the process. Practically (if the project is large enough), this is the fire safety engineer who is typically contracted as a member of the building design team but may also be contracted solely to solve a specific fire safety problem posed by either the building design or the regulator during the design stage of any building.

Once a building has been constructed, other relevant actors become involved in different aspects of fire safety. For example, the manager with responsibility for fire safety in a commercial building, the fire risk assessor contracted to carry out initial and ongoing fire risk assessments, and the fire safety enforcement officer who becomes involved on planned inspections of buildings, or when there is reason to believe that the fire safety precautions in a building are being ignored or abused.

Who were the interviewees?

The challenge for the researcher was to determine a coherent representative sample of actors that exemplified a sufficient diversity of views. It was thought that a diversity of views was the best way to describe the current situation existing in the fire safety industry. The researcher's background is that of direct involvement in the subject of the thesis (post-construction fire safety regulation), however, the researcher's experience was with the previous regulatory framework rather than the current regulatory framework. Nevertheless, the experience was sufficient to identify the key actors involved in the current regulatory framework.

Thirty-six actors were interviewed (please see Appendix 1 for details). Of those thirty-six actors, six were professional acquaintances known to the researcher before they were asked to take part. A further five actors were known to the researcher because of their reputations on key topics in the discipline of fire safety relevant to the subject matter of the thesis. The remainder were chosen either because they responded to a request from the researcher made on the social media platform, LinkedIn, or through a direct request from the researcher following a seminar, presentation, or meeting where they were present.

The locations in which the interviews took place were largely due to circumstance but they do indicate a measure of geographical diversity. The interviews were carried out, typically in the workplace of the interviewee, in locations such as, Edinburgh, Glasgow, Leicester, London, and Newcastle.

How were the interviews conducted?

The overriding factor in the mind of the researcher with regard to the interviewees was to make the best use of everyone's time. This meant a certain amount of management skill was necessary in trying to arrange interviews in the same locale on the same day, in being punctual for the meeting, and in imposing a strict time limit for the interview. Arranging interviews and being punctual is, of course, down to personal management but, to facilitate the length of the interview, the researcher decided on a specific strategy. This involved forewarning the interviewee of the framework of questions they would be asked during the interview (for details of the framework of questions please see Appendix 2).

The interviewees were forewarned, typically via e-mail but were also asked for permission to record the interviews. In return for permission to record the interviews, interviewees were given certain assurances. The assurances were that the recordings would be kept securely and that they would be deleted when the thesis was published. In all but one case permission was granted. In the case where permission was denied, the notes taken during the interview were written more fully and associated with the interview questions, as accurately as possible, immediately following the conclusion of the interview.

Where the interviews were recorded, this was done in an open manner. The request for permission was reiterated and the recording device was switched on and placed midway between the researcher and the interviewee at the commencement of the interview. This made the interviewee very much aware that their words were being recorded. Typically, the switching off of the recording device signalled the end of the interview.

During the interviews, the majority of interviewees got very quickly into their stride and talked quite freely and openly. This fulfilled the expectations of the researcher who knew that many in the fire safety industry have a passion for their work. The few who did not become at ease during the interview usually continued their uneasiness throughout the interview. In the majority of these few instances, the researcher felt that a case could be made to explain the reticence and thought that it was grounded in the interviewee's particular role. The hypothesis that seemed plausible was that their positions were so subject to political influence that they had learnt the value of choosing their words carefully. The researcher formed the opinion that guardedness surrounding their views was a daily necessity for them and not as a result of the request to be interviewed for this study.

The prospect of interviewees being harmed by the research was considered and, based on an assessment of the character of the study population, determined that the only likely harm would be damage to their reputation. The reasoning for this is that the individuals being interviewed were neither extremely young nor extremely old. They were not at risk from physical or emotional harm, the majority were interviewed in their workplace or at a place suggested by them and, during the course of their roles, regularly took part in meetings and interviews (please see Appendix 1 for more details of the interviewees).

With regard to the potential reputational damage, the interviewees were informed that the research was integral to a PhD study and that the data would be analysed with a view to using it in the conclusions of a thesis. They were informed that the thesis would be published at the end of the research and that the thesis would then be released into the public domain. In return for accepting these conditions, they were promised anonymity particularly if any of their words were quoted in the thesis. However, this promise came with a warning because although efforts would be made to secure their anonymity, there might be circumstances, not in the control of the researcher, where their identity could be inferred from being associated with the published material. In such a case, they were told that, in the event that the researcher was challenged with establishing their identity, the only option would be to refuse to confirm the identity. In only one case was the researcher asked to clarify these conditions before the interview went ahead. In the majority of cases the conditions were accepted without comment. In respect of the many quotes from interviewees used in the thesis, in most cases, particularly where the quote might be seen as contentious, the particular words used in the quote have been approved by the interviewee.

All of the interviewees' time was given voluntarily and received the grateful thanks of the researcher. One potential interviewee responded to the request for an interview and raised the subject of being paid for their time. The researcher viewed this one instance as exceptional and unexpected in the population under investigation. The suggestion of payment for being interviewed was politely declined and no interview took place.

Important issues arising from interviews

As the interviews progressed there were a number of issues that were raised in the interviews as the important issues in need of research. As these issues became more clarified, subsequent interviews concentrated more on them. In essence those issues were:

1. The credibility of the creation, transfer and utilisation of the package of fire safety information required to be assembled by pre-construction regulation. The credibility was being measured in terms of the relevance of the package, the performance of the regulation, the value of the package to its recipients, and the absence of any interest in the package of fire safety information by the post-construction regulation enforcers.

2. The establishment of the benchmark of an adequate fire risk assessment along with the definition of its descriptors: *suitable and sufficient* (in England and Wales).

3. The definition of competence of an individual purporting to be a fire risk assessor and the credibility and activities of the private registration organisations offering a badge of competency to a fire risk assessor.

4. Why the process of building design was a linear and one-way process rather than a looped process where information about the performance of the design was fed back to inform future design?

How was the literature chosen for review?

There is a variety of literature about fire safety consisting of Government published legislation, authoritative guidance documents, academic books and articles, and so on. There is a thriving research effort into the subject with much empirical evidence to support it. However, the subject of fire safety is ill-defined and poor definition results in different parts of the industry sharing different interpretations of what is, essentially, the same subject.

The majority of fire safety research is targeted at the pre-construction stages of building design and is typically intended to provide the empirical evidence necessary for the validation of performance-based building design. In contrast, much less research has gone into the post-construction occupation stage of a building. This, in itself, seems illogical as this stage lasts for a far longer period than the pre-construction stage. There is a variety of academic literature about how buildings can be utilised and how companies can streamline their business processes to achieve their optimum performance. There is also academic literature about how companies should train their staff to react in the event of an emergency, such as a fire, occurring. However, perhaps because fires are rare, academic literature with regard to how buildings, or companies, or organisations, prepare themselves against the risk of fire is largely absent. The literature dealing with this aspect of fire safety in buildings tends to be both practical and instructional, typically based on Government guidance dealing with the actual use of buildings rather than the theoretical possibilities of how fire risk should be managed. A particular weakness in the literature concerns that which deals with the sociology of the relationship between building occupation and post-construction fire safety regulation; where relevant material exists it is reviewed in Chapters 2 and 4 of this thesis.

The study of literature included secondary qualitative data which 'involves the analysis of an existing dataset, which had previously been collected by another researcher, usually for a different research question (Heaton, 2003, p.285; see also Hinds et al., 1997). The method can offer savings in terms of time and finance, an increase in the quality of data, the opportunity of building on previous research, and so on. The method can also suffer because of where and how the data is stored, how the storage is controlled, and whether it is restricted in some way. For example, the data may be sensitive, confidential, or costly to access. The data may also may need time for the researcher to examine and understand because it is in an unfamiliar format, or may not be compatible in some way (Heaton, 2003).

The overall approach of historical sociology enables investigation of questions about the development of social structures over a period of time in a way that sheds light of the motivations and practicalities of these developments. With regard to post-construction fire safety this covers a period of several centuries in the UK. The study has taken in literature that investigates the development of post-construction fire safety from the re-building of London in the late 17th Century to the contemporary intentions of modern-day post-construction fire safety legislation. This includes how British society dealt with the effects on fire safety of the industrialisation prevalent during the 18th and

19th Centuries, and the manner in which the legislation dealt with problem such as workers dying in factory and workshop fires. The review of 20th Century literature concentrates on the development of fire safety knowledge, its distribution between the local authorities and the fire authorities, and the effects on legislation and research following a number of high-profile fire fatalities. In addition, because of the two major pieces of safety legislation enacted during the 1970s, the review looks at literature that focussed on the differences between prescriptive legislation and performance-based legislation. Finally, the review looks at the political environment leading up to the adoption of significant European legislation, its integration into UK legislation, and the enacting of the current post-construction fire safety legislation.

Two repositories of knowledge were used to gather information: (1) the University of Edinburgh main library for books and articles from the online databases of academic journals, focussing mainly on issues in the sociology of science and technology; (2) the library at Fire Service College, Moreton-in-Marsh, for books, journals, and dissertations focusing mainly on fire, fire safety, and the fire and rescue authorities.

A number of internet search engines were used, for example, *Google*, *Google Scholar*, and *Google Books*, which were particularly useful for understanding the range of a subject of research as well as identifying the most likely source of the knowledge being sought. Online companies, *Amazon* and *Abe Books* were also used for buying relevant new and second-hand reference books.

The search terms used largely included the concepts articulated in the theoretical framework laid out in Chapter 2 that can be found expressed in the research questions. The search terms reflect the logic that would lead to the investigation of those concepts in association with the regulation of post-construction fire safety. So, for example, in Research Question 1, the main search terms included black-boxing, British Standards, building design, fire safety information, fire safety management, pre- and post-construction regulation of fire safety, and scripting. In Research Question 2, the main search terms included competence, expertise, fire risk assessment, and tacit knowledge. In research Question 3, the main search terms included deregulation, legislation, prescriptive and performance-based regulation, regulatory capture theory, and self-regulation.

Information was gleaned from the literature relevant to the search terms and notes were taken using both notepaper and computer. All notes were digitised and transferred using the software *Tiddlywiki* which is open source wiki software developed by an online community. The software allows notes to be simply organised and easily searched.

Details about the data

The data collected for analysis consists of both primary and secondary data, the primary data is qualitative data in the form of interviews, and was collected, manipulated, and analysed by the researcher. The secondary data is both qualitative data discovered in the public domain, and quantitative data collected and presented by authoritative bodies, namely, the fire and rescue authorities, the Government, and the Chief Fire Officers' Association (CFOA).

Secondary qualitative data has been used in the assembly of case studies to interpret and present some of the issues associated with the subject matter of the thesis. The secondary quantitative data is in the form of statistics derived from publicly available data. The Government publishes annual data in respect of the operational response and performance of the fire and rescue authorities, data such as: details of emergency incidents, numbers of fire injuries, numbers of fire safety audits, and so on. CFOA publishes data in respect of the enforcement activity associated with the post-construction fire safety regulations in England and Wales[22].

In respect of the qualitative data captured in the interviews, the aim was to record the interview so that it could be played back and faithfully transcribed. As soon as possible after each interview, the .mp3 file containing the interview was downloaded onto a computer, digitally filed in an encrypted folder prepared for the purpose, and erased from the storage system on the voice recorder[23]. A list was maintained recording the name, age, and qualifications of the interviewee, and the date of the interview. Each interview was transcribed by the researcher into one document containing the transcriptions of all the interviews. All interviews were transcribed in a consistent manner with an effort to retain the structure of the conversation that took place. The transcription of any interview should be an exact reproduction of the conversation and it should aim to capture its entirety whilst retaining the informality of its structure.

Following transcription, the raw data was edited to correct fundamental errors of speech, spelling, and punctuation and then coded to enable the identification of unique and potentially useful data. The process of coding labels the data and allows it to be compiled and organised into themes linking abstract expressions found in the transcribed texts. Ultimately, this management of the data enables it to be more easily and effectively incorporated into the written narrative. Ryan and Bernard (2003, p.87) suggest that you 'know you have found a theme when you can answer the question, What is this expression an example of?'

[22] The Scottish Government also publishes data on the performance of the Scottish Fire and Rescue Board but this data has not been used in this thesis.

[23] For details of how the data from each interview was recorded and stored, please see Section 3.8 on page 77 below.

However, to reach this stage involves firstly, reading and re-reading the transcribed data, making notes of expressions that resonate with the potential theoretical concepts whilst creating a logical system of codes. Secondly, it is necessary to collate and sort the codes into potential themes that can be utilised as compelling examples that relate to the theoretical framework of the research questions (Braun and Clarke, 2006).

The concept of coding is to assist in answering the question, what does it all mean? Coding can help tease out the desirable information from the data needed to explain the sociological concepts underpinning the thrust of a thesis. But because 'there exist no absolute hard-and-fast rules to follow', coding proves to be an inherently subjective way of organising data (Faherty, 2010, p.59). However, subjectivity is both a strength and a weakness: for example, when considering a transcribed interview, the strength originates from the evidence of the interviewee, the personal experience, and the unique individual perspective recounted about the subject under discussion. An additional strength is the rigour with which the conversation has been coded. The weakness of subjectivity is revealed because it is difficult to generalise and verify the experience and perspective of one interviewee against the experience and perspective of the many potential interviewees. This means that coding from the evidence of one interview (or a small number of interviews) cannot be used to support a statistical significance in the whole population.

The process of transcription, coding, and theming was made easier because, prior to commencing each interview, consideration was given to how the interviews would be carried out. For example, targetted questions were formulated for each interviewee and made known to the interviewees beforehand. Adopting a question and response style during the interviews assisted in making the transcriptions easier to code and theme, and then subsequently analyse. Managing the interview in order to retain the question and response style was particularly helpful in the one interview that consisted of a group of interviewees. Transcribing the interview soon after the event enabled the responses in this particular interview to be related to the individuals concerned and the concepts they raised, accurately coded and themed.

The transcriptions were coded by reading through them whilst concentrating on the attitudes adopted by the interviewees in their responses, the expressions emerging from the data, and the potential for parts of the dialogue to be used as quotes. Chunks of the dialogue fitting these elements were copied and pasted into the software chosen for the purpose[24]. At the same time, the emerging themes were classified commensurately with the concepts embraced in the theoretical framework and the search terms mentioned above. This allowed the data to be organised into a searchable managed system of storage. It was then a matter of querying the organised database during the writing of the thesis for useable content.

Kvale (1994, p.157) warns that the danger of gathering and analysing this type of qualitative data is that the 'results are entirely subjective and dependent upon the interpreters, who find only the meanings they expected to find'. However, this can be guarded against by 'triangulation' between a variety of sources of data, as well as by a sufficiently large interview sample. Any interpretation of the data is dependent on the perspective of the researcher, but this framing of the topic has been explicitly established in this thesis based on a wide variety of sources of empirical data. During the process, the researcher has attempted to answer a number of questions; firstly, what knowledge seems to be important in the data and, if it seems to be important, what makes this so? Secondly, if the knowledge is important and there is a good reason for

[24] For more information on the particular software chosen as a searchable database for note-taking, please see https://tiddlywiki.com/

its importance, what can be learned from it? Finally, is there a good reason for being able to learn from the knowledge in the context of the concepts expounded in the theoretical framework outlined in Chapter 2?

In respect of the quantitative data about the performance of fire and rescue authorities, the data is collected by each fire and rescue authority and submitted to the Government by a deadline each year. The data has been collected consistently for many years and is used by the Government to publish quarterly and annual performance statistics about fire, fire safety, and fire and rescue authorities. The data has been accepted by the researcher as being accurate but its accuracy is not verified by Government; verification of the data remains the responsibility of each fire and rescue authority.

The second database used in the thesis is quantitative data, again collected by the fire and rescue authorities, in respect of their enforcement activity. Fire and rescue authorities have had a statutory duty since 1988 to make publicly available a register containing certain details of their enforcement activity. This includes activity in respect of the prohibition, enforcement, or alteration notices they have issued, and the prosecutions they have undertaken. Initially, the registers were completed and kept at headquarter fire stations where the public could request access to view them. Latterly, however, the Chief Fire Officer's Association (CFOA) have created a database, accessible online, which assists in making the information more available publicly. Now, fire and rescue authorities fulfill their statutory duty by supplying their data to CFOA who then present it via their database. The data is not verified by CFOA, the responsibility for verification remains with each fire and rescue authority. The reason for the researcher's level of confidence in the accuracy of both this data and the data regarding performance mentioned above, is connected with his experience of the diligence with which fire and rescue authorities typically carry out their statutory duties in respect of publicly available data.

The data in the two databases is relatively consistent except for known inconsistencies in the Government database such as: the change in the collection and presentation of annual data from the calendar year (January to December) to the fiscal year (April to March). This change occurred towards the end of last century and was connected with the need to show performance data for each fire and rescue authority as a result of the Government's demand for accountability and value for money. Another known inconsistency is in connection with the number of fatalities and injuries from fire. This inconsistency arises because of the circumstances surrounding an injury or a fatality at a fire incident. For example, if a person is found deceased at the scene of a fire, the cause of death has to be determined and this involves a judgement about whether the death was a result of the fire, or whether, perhaps, the fire was set to cover up the death. Also if a person is removed from the scene of a fire having been injured by the fire but then subsequently dies at a later date, the cause of death again has to be determined and a judgement made about whether or not it was as a direct result of the fire or some intervening cause. A further complication leading to confusion about the number of fatalities from fire is that, because of the laws protecting people's data, information gathered by a health or hospital trust may not be available to the fire and rescue authority. In this case the death may go unrecorded by the fire and rescue authority and will not then be transferred to the Government database.

In respect of the CFOA Enforcement database, there are no inconsistencies known to the researcher.

Both databases are publicly available, however, the Government database is more accessible than the CFOA database. The Government database is readily available from the Government's website and can be downloaded as an Excel spreadsheet. In contrast, the CFOA database is not so readily accessible. The CFOA Enforcement Register is designed so that an individual can access the details about enforcement activity in respect of a specific address. Searching the database in this way makes the desired information readily available. However, manipulating the database as a whole to discover trends in the data is extremely laborious. Faced with this problem, the researcher contacted CFOA who agreed to supply a copy of the database provided that they would have access to any published results from its analysis. Consequently, the database was received in a .csv file which could then be manipulated using the software *LibreOffice Calc*.

How was the qualitative data collected and stored?

Most interviews were recorded on a Philips voice recorder purchased especially for the research. The recorder has proved to be satisfactory and there have been no problems with its performance.

The interviews were transcribed using free software called *ExpressScribe*. The free version can deal with the .mp3 files generated by the voice recorder while allowing a playback of variable speeds so that, on the odd occasion where accents were difficult to decipher, slowing down the playback enabled all but a few words to be recognised.

With regard to data protection, the researcher has been fastidious in the collection and storage of data. Recorded data on the voice recorder was transferred from the device to a computer at the first opportunity following an interview and stored in a folder encrypted with *TrueCrypt* software and then deleted from the voice recorder. The encrypted folder was immediately backed up to an external hard drive as part of the researcher's data backup strategy. Transcriptions of the recordings have been kept in the same encrypted folder.

The developers of the *TrueCrypt* software announced that they were ceasing development of their encryption software and advised users to seek alternative methods of encryption. This has caused the researcher to transfer the interview data to another folder encrypted with *TruCrypt* software's successor, *VeraCrypt* software.

What were the risks, biases, and conflicts of interest?

With regard to physical safety, the risks were acceptable in that they posed no greater risk than many people in business bear on a day-to-day basis. This is because most of the interviews took place at the workplace of the interviewee or in a mutually agreed public place such as a cafe. This meant that the meeting places were subject to British health and safety workplace legislation. British health and safety workplace legislation is designed to produce a safe working environment for employees but also, in this instance, for the researcher as the legislation also covers third parties such as members of the public.

Another risk was the risk of *lone working*, that is, an individual carrying out tasks and visiting locations in isolation without close or direct supervision. The control for this risk was the existence of a *flight plan*, that is, having another person knowing and monitoring the plan of appointments and locations with the expectation of a message via mobile phone at specific times. The lack of an expected message would have prompted an enquiry resulting in further actions if the enquiry was not answered.

With regard to bias, the experience of the researcher has had a strong influence on the choice of interviewee, the conduct of the interviews, and the analysis of the data. Although the researcher has attempted objectivity in this respect, there is no guarantee that this has been successful. The researcher's knowledge of the industry and the characters populating the industry, plus an understanding of the contentious issues pervading the industry must inevitably have influenced the administration of the study. Also, although any bias in the choice of interviewee, the preparation of interview questions, the choice of venue, and so on was unintentional, it must unavoidably have been present.

Consequently, there is a responsibility on you, the reader, who must read the administration and analysis of data in this thesis in light of these declarations. Inevitably, you must form your own opinions as to the objectivity of the researcher and the credibility of the results.

With regard to the process of interviewing, the author was not an experienced interviewer but has experience of carrying out interviews when necessary. For example, the researcher has carried out interviews and recorded and transcribed them as part of a Master's thesis. Other interviews have been carried out as part of the day-to-day management of a fire and rescue service, and yet other more formal interviews have been carried out under the rules of the Police and Criminal Evidence Act (1984) in respect of offences under the Fire Precautions Act (1971).

What are the limitations of the methodology?

There are a number of limitations of the methodology:

- One significant limitation is the anonymity of the interviewees. This has the effect of generalising the research and denies subsequent researchers the opportunity of challenging the source of a quote or an anecdote. The concept of anonymity was the choice of the researcher who calculated that the offer of anonymity would encourage fire safety practitioners to be less guarded in their comments.

- Another limitation is that the research is confined to parts of the UK and not all of the UK. The research is confined to the countries of England and Scotland which, unfortunately, discriminates against Northern Ireland and Wales. The reason for this is that, although the legislative base in respect of fire safety is the same in England, Northern Ireland, and Wales, it is different in Scotland. This is because fire safety legislation for England, Northern Ireland, and Wales is enacted by the UK Parliament, whereas Scottish fire safety legislation is enacted by the Scottish Parliament. The researcher wished to explore the two most different fire safety regulatory regimes.

- The research confines itself to four types of actors : fire safety engineers, fire safety managers, fire risk assessors, and fire safety enforcement officers. These are the actors involved with the regulation of post-construction fire safety, in the fire safety design of buildings and then the regulatory circumstances surrounding their occupation. This is logical as the four actors are those directly affected by fire safety regulation and are those who have the most influence in that respect. Other actors in the fire industry are affected by regulations but they are different regulations. For example, the regulations that affect the fire equipment manufacturers and installers are to do with manufacturing and installation standards rather than building design.

- Qualitative research in the form of interviews unavoidably introduces bias on the part of both the interviewer and the interviewee. However, the significance of this bias can be limited by corroborating evidence from several sources (other interviews and published accounts). Moreover, although the interviewees are likely to have a tendency to bias their responses in favour of themselves or their role, in the opinion of the researcher, the majority of views expressed suggested authenticity and sincerity.

Next chapter

Following the Great Fire of London in 1666, the regulation of fire safety was employed to prevent a single building fire destroying large parts of Britain's towns and cities. Later, fire safety regulation was divided into two categories: (1) pre-construction, controlling the design of buildings; and (2) post-construction, controlling the occupation of buildings. The next chapter explains where that division is rooted and, focussing on post-construction fire safety regulation, looks at the influences that have shaped current post-construction fire safety regulation.

The Development of UK Fire Safety Regulation

Introduction

The regulation of fire safety in the UK has changed since it first gained momentum during the 17th Century. It has diverged into: (1) the regulation of pre-construction fire safety, that is to say, the regulation of the fire safety design embedded in a constructed building; and (2) the regulation of post-construction fire safety, that is to say, the regulation of the manner in which an occupied building is utilised from its construction until its demolition. The main approach to both pre- and post-construction regulation of fire safety has altered significantly during recent years, from a prescriptive approach to a goal- or performance-based approach. Also having a large influence on the regulation of post-construction fire safety has been the fundamental reorganisation of the operational practices of the fire and rescue authorities, the way their resources are determined, and how their resources are utilised.

This chapter recounts that the first serious attempt to regulate fire safety in buildings came from the response to the devastation caused by the *Great Fire of London* in 1666. From then to the present day several different approaches to the regulation of fire safety have been instigated, culminating in the current regulatory approach. To the citizens of London the regulatory response to the Great Fire may have been seen as radical and over-bearing after centuries of very little in the way of fire safety regulation. Despite the honourable intentions of the 1666 legislation in attempting to prevent a similar occurrence when London had been rebuilt, its citizens could easily forget those legislative virtues in their desire to rebuild their houses in the same locations using readily available cheap materials. Today's population is more used to the restrictions imposed by regulation but the parallel with the citizens of 1666 is that today's population considers that the current regulatory regime is regarded as radical and considerably different from the regime that it displaced.

Pre-construction regulation of UK fire safety

How the regulation evolved

Over subsequent centuries the Act for Rebuilding the City of London (1666) was updated and replaced by other key legislation essentially dealing with the construction and design of buildings in London. Because of the way the 1666 fire had swept through London, resisting attempts to halt its progress, the regulations drafted in response focussed on the threat to one building posed by a fire in its adjacent building. Similar fires occurred in other towns, for example, Northampton in 1675 when 'above 600 dwelling houses were then burnt, and more than 700 families thereby deprived of their habitations and property' (Anonymous, 1847, p.68), and Warwick where, in 1694, an 'irresistible fire in five howers time consumed all ye High-street, Church-lane, Ship-street, the Great Church, many lanes and other buildings' (Parkes, 1827, Note 1, p.50).

Legislation passed following such fires, particularly in the case of Warwick, in principle reflected that which had been enacted in London in 1666. This pattern remained until the middle of the 19th Century when, under the Local Government Act (1858), local authorities were given powers to create local bye-laws (essentially, the law of the town or settlement) with regard to the structure of walls of new buildings for securing structural stability and prevention of fire. Building designers anywhere in the UK were now required to deposit plans with the local authority and the local authority were required to make sure they conformed to fire safety regulations before the buildings were constructed.

Control of the construction of buildings using prescriptive regulation written in bye-laws continued up until the middle of the 20th Century until Scotland signalled a change in the enactment of the Building (Scotland) Act (1959). The change in this legislation was that of the approach to building design and it was to have a major effect on the approach to building regulation throughout the UK.

The initiative had come from the *Report of the Committee on Building Legislation in Scotland* (The Guest Committee) set up under the chairmanship of Lord Guest in 1954. The Guest Committee had been ‘charged with securing a system of building control which ensured uniformity of standards while being flexible enough to allow innovation particularly in the context of new building techniques and the development of new building materials’ (Bett, 2003, p.341). The Building (Scotland) Act (1959) gave responsibility for building control in Scotland to Scottish Ministers and unified the standards previously controlled through local bye-laws. The Building Standards (Scotland) Regulations (1963) were enacted under the Building (Scotland) Act (1959) but proved to be controversial because they incorporated the principle established by the Guest Committee ‘that regulations should not be expressed in terms of methods of construction and types of materials but rather in terms of performance’ (Bett, 2003, pp.341-2). Performance-based regulation was a radical movement away from the normal prescriptive regulations.

The radical approach taken by Scotland with regard to performance-based regulation of buildings was not reflected in England and Wales until the enactment of the Building Regulations (1985), which were introduced under the Building Act (1984). This gave power for the Minister to approve or issue guidance documents regarding how to achieve the requirements set out in the building regulations. In England and Wales, these documents are referred to as the *Approved Documents*, whereas in Scotland, they are known as *Building Standards*. Both sets of documents share the criterion that achieving the standard published in the documents could be taken as tending to provide evidence of compliance with the regulations.

Since 1963 in Scotland and 1985 in England and Wales, in respect of the approach to the design of a building, the building designer has been offered a choice. She can either conform to the prescriptive standards of the published documents or she can set the published documents aside and achieve the functional requirements in the regulations by an alternate method. So long as she can demonstrate to the regulator that the building design complies with the functional requirements of the regulations, the building design will be deemed to be in compliance with the regulations. Since compliance with the prescriptive guidelines provided by the *Approved Documents* in England and Wales, or the *Building Standards* in Scotland, is considered sufficient for approval of a fire safety design, alternative approaches using performance based design often seek to demonstrate *equivalence* to these guidelines. However, this can prove difficult, not least because the prescriptive standards do not indicate quantitative performance outcomes against which the regulator can compare the design. The building designer thus has to work harder to convince the regulator that the regulations have been met where a performance based approach is taken.

The Holroyd and Robens Committees

Major changes to UK safety regulation stemmed from the work of the Holroyd Committee, a committee set up under the chairmanship of Sir Ronald Holroyd in 1967, and the Robens Committee, a committee set up under the chairmanship of Lord Robens three years later in 1970. The Holroyd Committee sat for three years inquiring into the governance of the fire service, the relationship between Government and the fire authorities, their functions, their efficiency, recruiting and training arrangements, pay and conditions of service for fire-fighters, what fire prevention measures were in place, how fire research was carried out and how it was applied (Holroyd, 1970). The Robens Committee sat for two years 'to review the provision made for the safety and health of persons in the course of their employment' (Robens, 1972). The recommendations of both committees led to the enactment of major safety legislation in the UK. Recommendations from the Holroyd Committee lead to the enactment of the Fire Precautions Act (1971), and recommendations from the Robens Committee lead to the enactment of the Health and Safety at Work etc. Act (1974).

That there are two major pieces of safety legislation enacted within a few years of each other is intriguing because it raises the question of why fire safety legislation is treated differently from health and safety legislation in the UK? Essentially, risks arising from fire hazards and risks arising from other health and safety hazards are similar in that they offer the potential of harm to people. The risk of harm is dealt with in the same way whether the risk is denoted as a fire risk or a health and safety risk. The methodology is that a hazard and the people at risk from that hazard are identified, the risk from the hazard is assessed and a measure to control the risk is determined, finally the control measure is embedded into the management system so that it can be maintained and kept under review.

An intriguing anomaly is that the two pieces of legislation involve markedly different approaches. The approach taken in the Health and Safety at Work etc. Act (1974) is a self-regulating, performance-based approach which was quite innovative at the time it was enacted. The approach was markedly different from the bureaucratic, prescriptive approach taken in the Fire Precautions Act (1971), legislation enacted three years earlier.

The recommendations made by the Holroyd Committee were to have a big impact on the UK fire service, but they also had an effect on the fire safety regulatory regime. The Committee thought that fire safety legislation should be regarded in two strands, formalising the distinction between pre- and post-construction fire safety regulation. One strand should deal with the design and construction of new premises, and alterations, modifications, and extensions to existing premises, while the other strand should deal with the premises when they were occupied following completion of construction. Two different regulators could be responsible for each different strand: the local authority could regulate the former strand, and the fire authorities, the latter strand. In determining the two strands of the regulation of fire safety, pre- and post-construction, the Holroyd Committee were confirming the current situation in respect of the local authorities' involvement in pre-construction regulation, it was the focus on post-construction regulations that was novel. The committee could see a natural cut-off point when a building had been completed and before it was occupied. They did not see as feasible the amalgamation of pre- and post-construction regulations because management of fire safety in an occupied building, involving the unreliability of humans, goes beyond the scope of regulations controlling the design and construction of buildings. They thought that this stage would be better regulated by the fire authorities.

Post-construction regulation of fire safety

European influence on fire safety

Two European Directives promulgated in 1989 – Council Directive 89/391/EEC and Council Directive 89/654/EEC – informally known, respectively, as the framework directive and the workplace directive, were also significant in the change in the approach to the regulation of post-construction fire safety in the UK. The bureaucratic, prescriptive approach present in the Fire Precautions Act (1971) was to make way to the self-regulated, performance-based approach already present and active for the previous fifteen years in the Health and Safety at Work etc. Act (1974). However, there was a problem. The European Directives were only predicated on one of the two principles supporting the way that self-regulated, performance-based regulation was already operating in the UK. The principle common to both the UK regulation and the European Directives was that those that created the risks should be responsible for controlling them. The principle that was present in UK regulation but not present in the European Directives was that of proportionality: the concept that the enforcement of a safety standard should be proportionate against the risk posed by non-compliance with the regulations. This principle had operated in the UK for many years and had been described by imagining a pair of scales where ‘the quantum of risk is placed on one scale and the sacrifice involved in the measures necessary for averting the risk (whether in money, time or trouble) is placed on the other’ (Edwards v National Coal Board, 1949; Barrett and Howells, 2000, p.176). In the world of health and safety, the concept had been inherent in the expression, *so far as reasonably practicable*[25]. The

[25] Reference to Edwards v National Coal Board (1949) and an explanation of its relevance to the concept of proportionality in risk assessment can be found on the HSE website http://www.hse.gov.uk/risk/theory/alarpglance.htm

problem was solved by the UK's successful defence of the principle and its application of the European Directives following its summons to the European Court of Justice on 21 March 2005[26].

Current fire safety legislation

The Government's initial response to the European Directives in respect of post-construction fire safety was to enact the Fire Precautions (Workplace) Regulations (1997) (amended by the Fire Precautions (Workplace) (Amendment) Regulations (1999)). These regulations ran alongside the existing legislation, the Fire Precautions Act (1971), and were applied to all workplace premises that had been exempt under the existing legislation[27]. This commensurate arrangement satisfied the European Directives' requirement for the provision of health and safety in the workplace in respect of fire safety.

The arrangement lasted until 2006 when the Regulatory Reform (Fire Safety) Order (2005) (which applies in England and Wales, and Northern Ireland), the Fire (Scotland) Act (2005), and the Fire Safety (Scotland) Regulations (2006) were enacted. These enactments consolidated fire safety legislation in the UK repealing both the Fire Precautions Act (1971) and the Fire Precautions (Workplace) (Amendment) Regulations (1999) amongst approximately seventy other pieces of primary fire safety legislation. The enactments also marked a fundamental change in fire safety legislation between Scotland and the rest of the UK; fundamental because the Scottish legislation was enacted by the Scottish Parliament rather than the UK Parliament. With regard to the different

[26] For more information on the judgement of the UKs application of the concept of *reasonable practicability* given by the European Court of Justice, please see http://curia.europa.eu/juris/liste.jsf?language=en&num=C-127/05

[27] There is a historical distinction between workplace premises and dwellings with regard to the application of fire safety regulation in the UK. For example, single family dwellings are subject to pre-construction fire safety legislation but remain exempt from post-construction fire safety legislation.

legislation, although there are subtle nuances caused by different words or phrases between the Scottish and the rest-of-the-UK legislation the impact on the regulated industry in all UK jurisdictions is effectively the same

The current post-construction fire safety regulations apply mainly to premises that are workplaces. They require the employer to carry out a fire risk assessment that informs the system of management and enables, for example, the creation of a suitable fire evacuation plan for all occupants. The process involves identifying and controlling the fire hazards that could potentially affect the safety of people who use the premises. The previous superseded post-construction fire safety regulations employed the same methodology but required different administration. For example, it was the regulator and not the employer who carried out the fire risk assessment. The task of the employer under the previous regulatory regime was to incorporate and utilise the risk control measures determined by the regulator into the system of management.

In the administration of the previous regulatory regime, the regulator was an intrinsic component in the regulatory process. Once the employer had initiated the process, as was the legal requirement, it was the regulator who controlled the rest of the process which concluded with the issue of a fire certificate. The fire certificate stipulated the regulator's determination of the necessary fire precautions for the premises. If, subsequently, the premises or the business process altered, then the regulations allowed for an amendment of the fire certificate representing the regulator's altered determination.

In the current regulatory regime, the regulator is an external component of the process. The expectation of the regulations is that the duty holder (usually the employer) will self-regulate by initiating the process and carrying out the requirements of the regulations without need of the regulator's intervention. The duty holder will carry out the fire risk assessment and incorporate the findings into the system of management. The determination of the fire risk assessment, whether it is represented by a document, a plan, or some other manifestation, represents the contemporary version of the superseded fire certificate.

Suitable arrangements for management are key to the successful administration of the current post-construction fire safety regulations. They are critical to maintaining the safe environment embedded in the building by the fire safety design. Malhotra (1986, p.228) states that '[t]he main objective of fire safety management is to ensure that in case of a fire all the safety measures provided will be available and occupants will be able to use them and they will be assisted to make their escape to a safe place'. Furness and Muckett (2007, p.2) underscore that message but further insist that 'effective safety management is the cornerstone of managing an economically viable business ... failure to manage safety adequately all too often results in death or injury, chronic ill health and damage to property and/or the environment'. Fundamentally, but unsaid in both of these above quotes, is that the arrangements for managing fire safety depend on the correct maintenance of the black-boxed components of the fire safety design. The correct maintenance is dependent on the accurate reading, interpretation, and assimilation of the fire safety scripts associated with the black-boxed components.

There are two key requirements relevant to the management of fire safety in the current post-construction fire safety regulations. These are: (1) the provision for a fire risk assessment (Regulatory Reform (Fire Safety) Order (2005, s.9) and the Fire (Scotland) Act (2005, s.53)); and (2) the provision of suitable fire safety arrangements (Regulatory Reform (Fire Safety) Order (2005, s.11) and the Fire Safety (Scotland) Regulations (2006, s.10)). These two requirements are logically linked: a suitable and sufficient fire risk assessment is essential for identifying the fire safety measures necessary to control the risk; while an appropriate arrangement of management procedures is essential to utilise the measures identified in the fire risk assessment and to monitor when the measures need to be reviewed.

UK Government influence

Influential reports

In the Line of Fire

The risk-based approach of the current post-construction fire safety regulations and the establishment of risk management in the regulation of fire safety in the modern fire and rescue service transpired because of the UK Government's acceptance of recommendations made in certain reports and reviews they had commissioned. The argument for updating and rationalising the fire service was set out in the document *In the Line of Fire* published by the Audit Commission (1995a)[28].

While praising its performance to date, the Audit Commission observed that the achievements of the fire service were constrained by the traditional framework in which it operated. More malleable conditions of service would allow the fire authorities flexibility when reacting to changing local conditions. For example, empirical evidence suggested that the time of day that many firefighters started and ended their daily shifts corresponded with the time of day they were at their busiest answering the most calls for assistance. More flexible conditions of service would allow a fire authority to respond to empirical data such as this enabling them to make changes to the administration and efficiency of its fire service. At the time, however, this type of management

[28] The Audit Commission was an independent public corporation existing between 1983 and 2015. Part of its remit was to monitor and audit the performance of the fire and rescue service.

was extremely unlikely due to the nationally agreed conditions of service under which firefighters were employed.

The Audit Commission (1995a) also observed that the focus of the fire authorities was on firefighting rather than fire prevention. The fire authorities concentrated on providing the resources needed to respond to calls for assistance with the correct *weight of attack* for the type of incident that firefighters were being mobilised to attend. They had to determine the number and type of resources for the operational response that was needed for deployment to any incident within their geographical area. This was referred to as *fire cover* but it was difficult to criticise or justify the calculations that fire cover was based on. The criteria used in the fire cover calculation referenced the built environment, or the density of buildings in the area, and any unusual special risks such as chemical works or petroleum storage facilities. It disregarded other criteria that might be regarded as pertinent, such as the type of building or the type of occupancy of a building or that the occupancy of a building may change throughout the day or during the days of the week. For example, the operational response to a *999 emergency call* in a town centre was identical whether the call for assistance came at midday or at midnight. Whether or not a building was old and traditional or new and modern made no difference; every building received the same treatment. The standard took no account of either the quality of fire protection designed into a building or the capability of fire safety management provided by the occupier to maintain that quality. A poorly managed building was regarded as having the same level of risk as an identical well managed building. Operational planning took no account of 'demographic factors or the extent to which risk can change with the time of day or year' (Audit Commission, 1995a, p.4). The lack of explanation supporting the criteria used in calculating the standard underlined the fact that it was based on historical precedent rather than an analysis of recent data.

The illogicality of the standard of fire cover gave impetus to the Government proposal for a significant shift in the objective of the fire authority so that it focused on concentrating resources on preventing fires rather than extinguishing fires. This could be done by educating the community about the dangers of fire and thus assisting the community to help itself. As well as drawing attention to the consequences and inconvenience of suffering a fire, there was also much that could be done to inform the community about ways to protect itself from fire, particularly for the people most at risk.

Safe as Houses

The people who were most at risk from fire was apparent in any analysis of the fire incident data. For example, Figure 1 shows a composite chart presenting the number of fatalities from fire in dwellings[29], other buildings[30], and road vehicles between 1991 and 2013. For more clarity and an evaluation of their influence, the approximate date of specific documents influential in the rationalisation of the fire service has been included in Figure 1.

The document *Safe as Houses* was the report produced by the Community Fire Safety Task Force (CFSTF), set up to examine the contemporary situation and 'propose a Community Fire Safety strategy and supporting action plans which will significantly reduce the numbers of fires and fire casualties in dwellings over the next five years' (Home Office, 1998, p.1). The CFSTF focussed on those fire casualties that formed the largest number in the UK, casualties as the result of a fire in a dwelling. This category of fire fatalities

[29] 'A dwelling is defined as "a property that is a place of residence i.e. occupied by households". The definition includes residential homes, sheltered accommodation, caravans, houseboats and Houses of Multiple Occupancy (HMO) but it does not include hostels, hotels and residential institutions, bed and breakfast establishments, nursing/care homes and student halls of residence' (Home Office, 2017, p.2).

[30] 'Other buildings' are buildings other than dwellings, the '[l]argest components of which are commercial, health and education buildings' (DCLG, 2010, p.10).

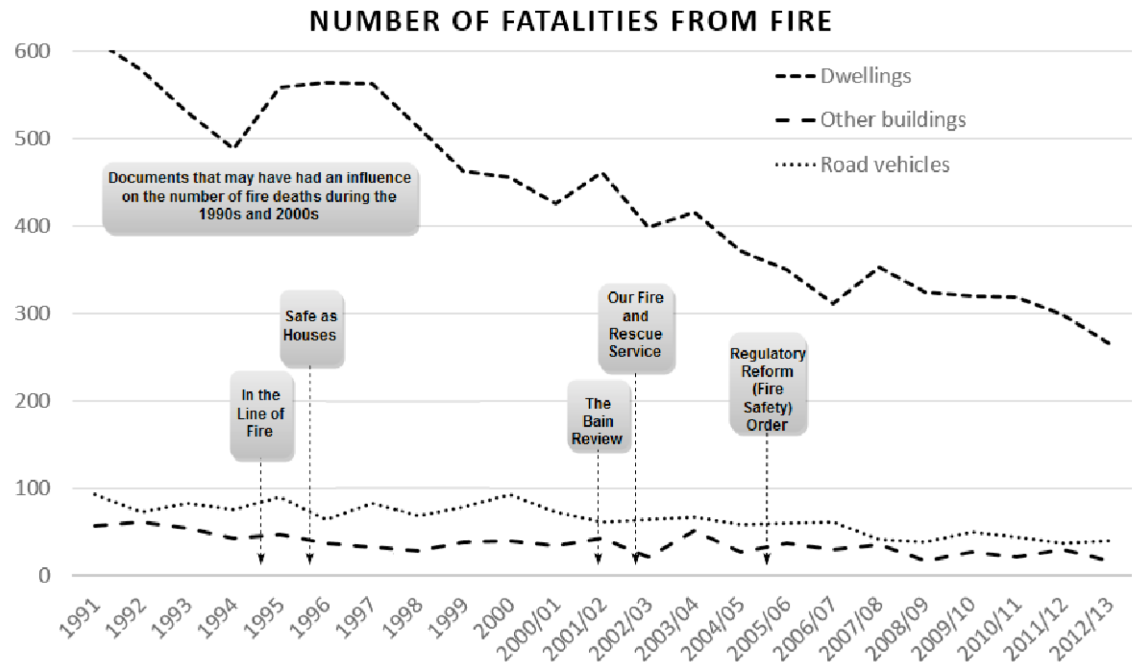

Figure 1 – Number of fire deaths during the 1990s and 2000s (Source: UK Government)

was not under post-construction regulatory control as dwellings were one of the categories exempt from post-construction fire safety regulations, so controlling fire in dwellings needed to be the subject of a different strategy. The CFSTF determined two categories of deaths in dwellings: (1) deaths as a result of accidental fires; and (2) deaths as a result of malicious fires. *Safe as Houses* focussed on deaths as a result of accidental fires in dwellings and identified those most at risk as households with children, particularly single parent families, and households made up of elderly people (Home Office, 1998, p.10).

The Bain Review

The Community Fire Safety (CFS) strategy resulting from *Safe as Houses* was initiated by empirical evidence generated by the accumulation of data gathered in respect of fire incidents in the UK. The strategy would cover premises which were not already covered by post-construction fire safety regulation but it would tailor its activities according to the analysis of empirical data. A similar strategy may have been happening with premises included in post-construction fire safety regulations but there was no consistent policy across the UK. The choice of premises and the frequencies of regulatory inspections were unique to each authority and not necessarily based on empirical evidence of those most at risk. This was to change because of the Government's reaction to the *Independent Review of the Fire Service* chaired by Sir George Bain in 2002 (informally referred to as the *Bain Review*).

The *Bain Review* was carried out in the tense atmosphere of a fire service labour dispute over pay and, although historically, firefighters had been of low political saliency (Davis and Norton, 1992), this began to change as the 21st Century approached. Issues such as lack of sexual and racial diversity amongst fire service employees, political arguments brought about by the gradual regionalisation of fire services, and a growing perception of regionally mismatched fire cover began to unsettle the dependability of a generally stable public service. The culmination of this shift in direction came with the instigation of the Bain Committee in 2002 to investigate the future organisation and management of the fire service in terms of its responsibilities, its operational response, and its efficiency and effectiveness. The responsibility for the fire and rescue service transferred from the Home Office to the Office of the Deputy Prime Minister (ODPM) in 2001[31], and the ODPM seized the opportunity to challenge existing traditional work practices. The Committee's terms of reference specified that its recommendations should be in the context of pay arrangements, conditions of service, and their affordability across the economy. The Committee concluded as to what they thought was the problem, determined who was to blame for the development of the problem, and stated how they saw the fire service's future development to address the problem.

[31] This proved to be a temporary measure as responsibility for the fire and rescue service returned to the Home Office in 2016.

Bain (2002, p.2) noted, ‘society and the requirements it places on a modern Fire Service have changed enormously ... The Fire Service as an institution has not changed in turn’. The Committee had found plenty of evidence of fire authorities doing their best to deliver community campaigns to encourage better fire safety, but were promoting change and innovation ‘against the obstacles of unhelpful legislation’ (Bain, 2002, p.2). The fire service should have one aim and that was ‘a reduction in the loss of life, injury, economic and social cost arising from fires and other hazards’ (Bain, 2002, p.4). The fire service needed to abandon its identity as a reactionary firefighting force taking up only about 5 to 10% of its total activity and had to face the imperative to develop into a broad, multidisciplinary role improving all aspects of fire safety across the community.

The fire service’s core purposes were viewed as needing to coordinate an integrated approach in the way that emergencies were managed. An emergency response would need to be delivered but this would be a last resort, coming after effective fire safety regulation of the built environment as well as fire prevention work in the community (Knight, 2013). In ameliorating the situation, the Government undertook to reform and modernise the fire and rescue service, setting out its agenda in three core documents; (1) an aspirational report titled *Our Fire and Rescue Service* (ODPM, 2003), (2) new legislation in the form of the Fire and Rescue Services Act (2004) and (3) a methodology in the *Fire and Rescue National Framework* (DCLG, 2008a).

Our Fire and Rescue Service

The Government carried out a research-driven investigation to examine the findings of the document *In the Line of Fire* (Audit Commission, 1995a). The Fire Review Task Group (FRTG) was set up to investigate and report on the recommended risk-based approach applicable to the deployment of vehicles, equipment, and personnel (CFBAC, 1998, 2002). The FRTG strived to achieve a balance between the public's expectation of life safety, property damage, and environmental risk, and the correct response to tackle those risks. If the protection to the public was to be enhanced, it must be cost effective, primarily focussed on life safety rather than property protection, and it must do so without increasing the risk to the public or the fire fighters: 'Its main achievement was to develop a risk assessment methodology incorporating the use of fire safety measures, which required brigades to adopt a response planning process based upon the concept of the Worst Case Planning Scenario' (Seifert and Sibley, 2005, p.58). The FRTG acknowledged that the Audit Commission had recommended that strategies to prevent fire should be much more of a feature of a fire and rescue service and, during the course of their work, they formed the view that *prevention* and *cure* were complimentary approaches to achieving public safety. This paved the way for the integrated risk management planning that today influences all of the daily tasks of the modern fire and rescue service[32].

The FRTG concluded that the fire and rescue authorities' operational deployment of resources, that is, its fire cover, could be based on a risk assessment, and that the risk assessment should also take environmental risk, heritage risk, and property risk into account. Fire and rescue authorities' could reduce risk by:

- 'promoting fire precautions, including fire prevention (i.e. reducing the probability of exposure to the hazard); and/or
- providing firefighting intervention (i.e. reducing the consequence of exposure to the hazard)' (CFBAC, 2002, Technical Paper B, p.B1).

[32]For more information on integrated risk management planning and its application please see https://www.gov.uk/government/collections/integrated-risk-management-planning-guidance (accessed on 15 Dec 2018).

If a level of risk could be defined and accepted as a national tolerable level of risk, the fire service could organise itself and undertake to make sure this level was not exceeded and, where it was considered to be cost-effective, work to reduce it (CFBAC, 1998).

Following the work of the FRTG, the Government's intentions and its expectations of a modern fire service were published in the White Paper: *Our Fire and Rescue Service* (ODPM, 2003). This set out a vision to reform the fire service through a number of improvements. The fire service was to have a wider more explicitly funded rescue role and it was to shift from being a predominantly reactive firefighting force to a predominantly proactive fire prevention organisation. Protecting the community from fire was to become a statutory responsibility.

The reforming agenda brought about a number of significant changes to the way that the fire service operated throughout the UK including, amongst other things: the change in name from fire authority to fire and rescue authority (fire service to fire and rescue service); the requirement to provide risk management planning; the statutory requirement to carry out community fire safety; and the ability to direct the work of the fire and rescue authority through a national framework document[33] (ODPM, 2004).

The first national framework document spelt out the Government's proposals to modernise the fire and rescue service. Amongst the list of developments in respect of the regulation of post-construction fire safety was risk management planning, which was the mechanism intended to replace prescription in both reactive and proactive activities. Risk management plan-

[33] For more information about the National Framework Document please see https://www.gov.uk/government/collections/fire-and-rescue-national-framework-for-england in resect of England, http://www.gov.scot/Publications/2016/09/8011 in respect of Scotland, and http://gov.wales/topics/people-and-communities/communities/safety/fire/national-framework/?lang=en for Wales in respect of Wales.

ning was intended to facilitate the fire and rescue authorities to better plan their responsibilities in improving the safety of the communities they sought to protect.

Risk management planning

Under *The Fire and Rescue Service National Framework* each fire and rescue authority was obliged to produce an integrated risk management plan (IRMP). This plan would set out how the authority intended to deploy its resources to carry out the core aims and objectives presented in the national framework: how the number of incidents was to be reduced, how the post-construction fire safety regulations were to be enforced, and how firefighting and rescue work was to be carried out. The IRMP was to be the strategic document that would look forward and set out what each fire and rescue authority would do in the year ahead (ODPM, 2004).

IRMP was, perhaps, the most radical component of the Government's agenda to modernise the fire and rescue service but it was designed to encourage closer links between the two arms of the fire and rescue service, the reactive operational arm and the proactive fire safety arm. The reactive operational arm was what every firefighter joining the service was trained for and became experienced at, having served a probationary period before becoming a fully-fledged firefighter. Only a proportion of those firefighters became involved in the proactive fire safety arm and became qualified in regulatory enforcement.

The division between the two arms had developed as a result of the way that the fire service had evolved. The operational arm was organised under the Fire Services Act (1947) while the fire safety arm was organised to administer the Fire Precautions Act (1971). Unfortunately, even though they both dealt with fire in buildings, despite various local initiatives in some fire and rescue authorities, nationally there had been little attempt to bring together the two arms. This changed when the reforms went ahead because the guidance for risk management planning implies that the results of both operational and fire safety activity should be fed back to inform the risk management planning process. This encourages the fire and rescue service to consider itself as one entity.

The imposition of risk management planning emphasized the necessity of shared information and greater co-operation between the reactive operational arm and the proactive fire safety arm. The need for proactivity rather than reactivity, particularly in respect of community fire safety, meant that the reactive arm had to adopt methods already used by the proactive arm in post-construction fire safety regulation and adapt them for use in targeting those most at risk.

A component of the IRMP is a risk-based premises fire safety inspection programme relying on the analysis of data gathered locally. Fire and rescue authorities formulate policies that govern the collection, analysis, and use of data in order to verify their specific programme. West Yorkshire Fire and Rescue Authority, for example, appoint specialist personnel to engage in their fire risk reduction programme but engage all of their personnel to gather risk data as part of their normal role (Charlston et al., 2011). The data gathered is not confined to data that may affect the life safety of the community, there are other criteria pertaining to the potential loss or risk associated with a premises taken into consideration in the analysis. For example, a premises may be of strategic importance such as being the sole supplier of a unique product for the district, or the region, or even the nation. It may be that stock kept in the premises is of exceptional value or it may be prohibitively expensive to restock. The premises may be of historical value or it may be of international significance such as a medical research institute. The loss of the premises may impact significantly on the community, or it may be that there exists a great potential for causing damage to the environment in the event of a fire[34].

Regulation enforcement

The decision to take any enforcement action under the post-construction regulation of fire safety is a subjective decision on the part of the fire and rescue authority but it is monitored in this endeavour and its actions are subject to the management framework set out in the *Enforcement Management Model*[35] (HSE, 2013). Fire and rescue authorities must also have regard to the provisions of the *Regulator's Code* which 'provides a flexible, principles based framework for regulatory delivery that supports and enables regulators to design their service and enforcement policies in a manner that best suits the needs of businesses and other regulated entities' (BRDO, 2014, p.2). Evidence gathered for prosecution in the course of enforcement activity is collected under the authority and obligation of the Police and Criminal Evidence Act (1984)[36].

Fire safety audit

The fire safety audit (CFOA, 2008) is the mechanism used by fire and rescue authorities to carry out enforcement of the post-construction fire safety regulations. 'The Fire Safety Audit and Data Gathering Form ... will be used for all audit, enforcement and inspection visits. It enables personnel to collect

[34] For more information in respect of the list of potential loss/risk criteria associated with premises, please see CFOA (2009, p.27).

[35] The Enforcement Management Model provides a framework in which regulators can make fair and consistent enforcement decisions.

[36] With regard to the fire and rescue authorities, the Police and Criminal Evidence Act (1984) governs the search and seizure of evidence necessary to pursue their enforcement responsibilities.

identification and risk data about premises in a systematic and consistent manner' (CFOA, 2008, p.3).

The fire safety audit form consists of three parts; Part A: Site assessment; Part B: Fire safety audit; Part C: Calculation of relative risk level.

Part A facilitates the gathering of data about the premises. Some of the data will be used for reference purposes, some will be used to input into the Fire Service Emergency Cover software[37], and some will be used for the purpose of informing fire crews whilst they are responding to a future emergency incident at the premises.

Part B assists in the subjective comparison of the Articles contained in the Regulatory Reform (Fire Safety) Order (2005) or the guidance issued under the Fire (Scotland) Act (2005) against the conditions encountered in the premises. Part B concludes with an Initial Enforcement Expectation (IEE), which is the regulator's determination of the point where the extent of non-compliance is proportionate to the significance of the regulatory breach.

Part C brings together numerical values from Parts A and B and allows the relative risk level between different types of premises to be calculated, resulting in a risk rating for each type of premises.

[37] Fire Service Emergency Cover (FSEC) is the name given to the computer software provided for fire and rescue authorities to facilitate decision-making with regard to the type and location of operational resources using locally collected empirical data. More information about FSEC and, interestingly, why London Fire Brigade have chosen to eschew the provided FSEC software in favour of their own approach, can be found at http://moderngov.london-fire.gov.uk/mgconvert2pdf.aspx?id=1427 (accessed on 15 Dec 2018).

Initial Enforcement Expectation and Description		
Compliance Level	**Description**	**Initial Enforcement Expectation**
Compliance Level 5 **Enforcement Notice 'Fast Track'**	• Generally premises risk rating very high • Very serious deficiencies that may require structural alterations • Requirement for comprehensive major systems • Very serious issues such as no AFD system where required	Enforcement Notice
Compliance Level 4 **Enforcement Notice**	• Generally premises risk rating high • Poor management with numerous serious contravention's of fire safety legislation. • Disregard for fire safety issues with bad housekeeping and no risk assessment or records of training or testing. • Following a fire where greater emphasis is required to address deficiencies • History of previous enforcement or informal action	Enforcement Notice
Compliance Level 3 **Notification of Deficiencies**	• Generally premises risk rating medium • Numerous less serious deficiencies possibly with history of other minor issues • Poor management evident and inspector has lack of confidence that matters will be adequately addressed • History of previous enforcement or informal action.	Notification of Deficiencies
Compliance Level 2 **Notification of Minor Deficiencies**	• Generally premises risk rating low • Several less serious deficiencies but without a previous history. Inspector has confidence in the overall management of the premises that matters will be adequately addressed.	Notification of Deficiencies
There is no requirement to apply the EMM principles for Broadly Compliant		
Compliance Level 1 **Broadly Compliant**	• Generally premises risk rating low/very low or those premises in multi-occupied buildings not selected for a sample audit • Possibly no risk assessment carried out/recorded but building generally satisfactory in all other respects • Only very few minor deficiencies. Approach to include verbal advice/agreement and information (inspector to record any advice given) • Any situation where premises comply with the FSO but where additional measures would reduce the risk category • Consider giving business continuity/property protection advice if appropriate	Broadly Compliant Educate & Inform

Figure 2 – Initial Enforcement Expectation (IEE) and description (CFOA, 2009, Table 4, p.16)

Part B is perhaps the nub of the fire safety audit and where expertise is needed in comparing the conditions encountered within the premises with the substance of the Articles which define the regulations. In their online publication, SHP Online (2014) claim that the top five most cited regulatory breaches are: (1) the lack of, or poor quality, of the fire risk assessment; (2) the lack of consideration for the means of escape in the premises; (3) the lack of maintenance of fire installations; (4) inappropriate or inadequate firefighting equipment or fire warning system; and (5) the lack of emergency planning. It is no surprise that the regulatory breach involving the requirement to have an adequate fire risk assessment is the most cited because it can also be telling. Without due consideration of this requirement, the duty holder holds little evidence that she has considered any of the other regulatory requirements.

When enforcement officers determine breaches of the regulations, they are given a hierarchy of actions to assist them in resolving the situation (see Figure 2). The actions are incorporated into five compliance levels that cover the whole range of possibilities that may confront the enforcement officer. The compliance levels range from a state of being *broadly compliant* to a state that is so seriously out of compliance that the enforcement officer is considering immediate action to reduce the risk to life. The term *Fast Track* in Compliance level 5 reflects the immediacy of such a situation, referring to the short timescale that the enforcement officer is encouraged to achieve if it is thought that the breaches are very serious. Fast track encourages the use of the telephone and e-mail to coordinate with other agencies when processing the enforcement rather than using the more conventional, but slower, postal system.

Of note, in Compliance level 1, is that a premises that does not possess a valid fire risk assessment can still be considered to be broadly compliant. This may reflect the reality that total regulatory compliance is rare and: ‘Broadly compliant should not be construed as 100% perfect’ (CFOA, 2009, p.11).

A key concept that influences enforcement officers is proportionality and making the enforcement proportionate to the perceived risk. Figure 3 illustrates the concept and indicates that, with regard to the current fire safety regulations in the UK, life risk is more important than property risk. There is little regulatory consequence to a perceived high fire risk even though that risk may result in the destruction of the building and the pollution of the environment. In contrast, there are severe consequences to a perceived high life risk to the occupants.

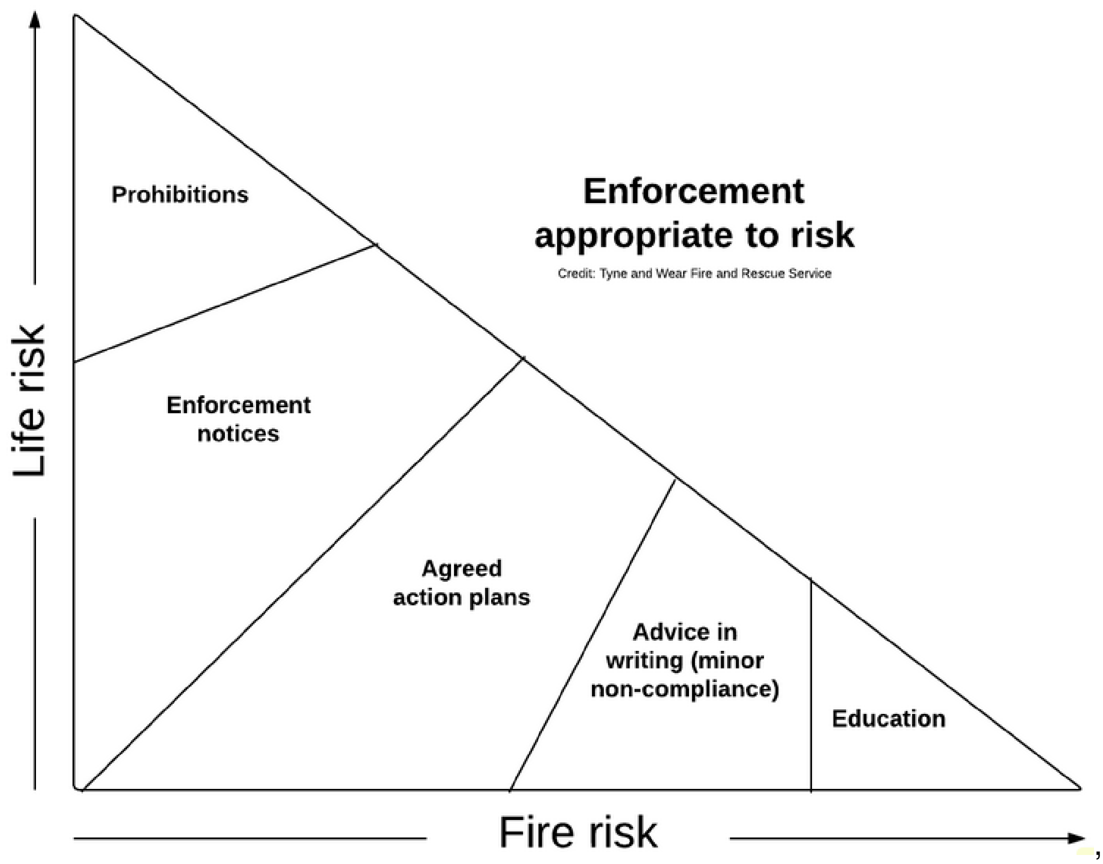

Figure 3 – Enforcement Matrix (source: Tyne and Wear Fire and Rescue Service)

A fire safety audit is not the same as a fire risk assessment: there is a marked difference between the two. A fire risk assessment 'is a tool to tell someone how to manage a building properly'[38]. A fire safety audit, on the other hand, is 'an examination of the premises and relevant documents to

[38] Interview with a fire risk assessor: No.15: Jan 2015.

ascertain how the premises are being managed regarding fire safety'[39]. A further difference is that the fire risk assessment is a comprehensive survey of the whole of the premises, identifying and assessing all of the fire hazards, and the people at risk. A fire safety audit, on the other hand, may only cover a part of the premises or focus on a specific aspect of the regulations. The specific part of the premises or aspect of the regulations chosen to be audited is determined subjectively working through guidance published by the Chief Fire Officer's Association (CFOA, 2008). The guidance itself is directed by standards set by Government and the Health and Safety Executive (BRDO, 2014; HSE, 2013) and monitored by Government (BIS, 2013).

Some fire and rescue authorities set out expectations associated with the fire safety audit as information for duty holders. They state that their fire safety enforcement officers will present themselves in uniform with identification and will expect to see evidence that the premises is being managed in accordance with the regulations. They go on to list the type of evidence that may expect to see, such as: a suitable and sufficient fire risk assessment, action plans relating to findings in the fire risk assessment, records for the testing of installed fire protection systems and of staff training, and so on. An audit simply evaluates what is found and checks it against the requirements of the regulations. It is a completely subjective exercise on the part of the enforcement officer and depends entirely on the enforcement officer's expertise and comprehension of the requirements of the regulations.

Because of the information it should contain, the fire risk assessment is usually the starting point of a fire safety audit. In many cases, it is probable that the production of an adequate fire risk assessment on request would curtail the

[39]Source: Gloucestershire Fire and Rescue Service (https://www.gloucestershire.gov.uk/glosfire/business-safety/the-audit-process/ (accessed on 15 December 2018)).

need for the subsequent fire safety audit. One fire safety enforcement officer has a general test used to prompt what approach he should take when visiting a premises: 'it's a case of, would I let my family work there? That's the test that I always do. If I'm uncomfortable then I might take action'[40].

Although a fire safety audit is not the same as a fire risk assessment, it is concerned with the safe environment in respect of fire safety in the premises. Therefore, a logical expectation might be that the fire safety audit would use the same fire safety information that was a regulatory requirement of the pre-construction regulations. Fire safety information should have been made available for the use of the duty holder in buildings built since 2007, in England and Wales, or 2013, in Scotland (as further described in Chapter 5). However, there is no regulatory clause, authoritative direction, or Government guidance with regard to the administration of the fire safety audit that mentions reference to the fire safety information. In other words, although there is a tenuous link between the pre- and post-construction fire safety regulations in requiring the provision of relevant fire safety information to assist the post-construction duty holder, this has not been extended to include the fire safety enforcement officer carrying out the fire safety audit. In fact, the methodology of the fire safety audit is predicated on gathering evidence based on the subjective judgement of the fire safety enforcement officer. It is as if the auditor is expected to treat all existing knowledge in a premises as suspect while encouraging them to create new self-generated knowledge for the purpose of the audit. This raises questions about the validity of the fire safety audit process and its use in the prosecution process. Because if the results of the fire safety audit are used in the prosecution of a duty holder, the prosecution may be based on fire safety information that was not available to the duty holder.

[40] Interview with a fire safety enforcement officer: No.11: Dec 2014.

Primary authority

Primary Authority is an innovative initiative to facilitate better regulation applicable across the UK[41] but it could be described as a form of regulatory capture. The concept was launched in 2009 but has only recently been applied to the regulation of fire safety. It purports to give better and more consistent regulation to the regulated industry, with the claim that: 'Primary authorities provide robust, bespoke advice that must be respected by all local regulators' (BRDO, 2015, p.4). Primary Authority refers to a scheme established by the Regulatory Enforcement and Sanctions Act (2008) whereby the Local Better Regulation Office (LBRO) may nominate a local authority[42] to be a primary authority (Regulatory Enforcement and Sanctions Act, 2008, s.25)[43]. The function of a fire and rescue authority nominated as the primary authority is that of giving advice and guidance to the regulated entity and other local authorities in respect of post-construction fire safety regulation. The potential result is that there is greater consistency and certainty available to business in the way that companies are regulated. It means that a company exploiting the scheme can operate a business in more than one geographical area but only be subject to the administration of one post-construction fire safety regulator. Normally, a business would be subject to the post-construction fire safety regulator in each geographical area in which it operated. This means that the primary authority from one jurisdiction, by virtue of the Regulatory Enforcement and Sanctions Act (2008), has primacy and can overrule enforcement decisions made by the

[41] More information about the differences in application of Primary Authority in the different jurisdictions of England and Wales, Northern Ireland, and Scotland can be found in *Better Regulation Delivery Office: Primary Authority Statutory Guidance* (BRDO, 2013, para.2.6, p.7).

[42] A fire and rescue authority is included in the term 'local authority' (Regulatory Enforcement and Sanctions Act, 2008, s.3).

[43] The Primary Authority Public Register can be viewed online at https://primary-authority.beis.gov.uk/par (accessed on 15 Dec 2018).

apparent regulator in another jurisdiction.

If, for example, following an audit, the designated fire and rescue authority for the geographical area feels that enforcement action against a business is necessary, before acting it must first notify the fire and rescue authority that has primacy under the framework of primary authority. The primary authority then has to determine what advice it has given to the business facing enforcement action and decide whether it 'is inconsistent with that advice' (DBEIS, 2016, p.153). If the action is considered to be inconsistent with advice previously given, the primary authority can 'direct against the proposed action' (DBEIS, 2016, p.154).

Summary

Regulation of fire safety has been a significant feature of UK legislation since at least the 17th Century. It has gradually evolved into a system with two distinct phases, each with its own regulatory framework. In essence, the first phase regulates building design and the second deals with building usage. This latter, post-construction regulation of a building's life is critical, of course, because it can last for many years, and see both changes of use and renovations that may affect the efficacy of the original building design. A key aspect of post-construction regulation thus hinges on the maintenance or adaption of a building's original fire safety design, in order to ensure that it continues to be valid.

However, the underlying principles of a fire safety design may not be self-evident because certain features may be *black-boxed* as aspects of their inner workings are opaque to building users. Whether done by an architect or a specialist fire safety engineer, and whether designed according to prescriptive rules or a performance-based design, a building's fire safety design embodies a vision of how the building will be used. The fire safety design thus embodies a *script* of expected user behaviour, and the correct functioning of fire safety features may depend on users *sticking to the script*. As increasingly complex fire safety solutions are adopted in buildings constructed to performance-based designs, it becomes ever more important that users understand how to maintain and use black-boxed fire safety features. This makes it all the more vital that there is effective communication of the fire safety design between pre- and post-construction actors.

The move to self-regulation of post-construction fire safety in the UK also means that the quality of the fire risk assessment is crucial. Not only does this pose a challenge for the duty holder with regard to how they decide who should carry out the assessment, particularly as regards knowing who is suitably qualified, but it also raises a dilemma with regard to who possesses the relevant expertise. It poses the fundamental question of whether an individual fire risk assessor can carry out an adequate fire risk assessment if they are an expert in only one of the two expertises necessary? It may be that an essential characteristic of assessing fire risk in a premises requires that individual to be an expert in two expertises: (1) expertise in the dynamics of fire and the behaviour of people when under duress from an emergency situation; and (2) expertise in the characters, culture, and conventions of the premises under assessment? If so, then the solution may require a fire risk assessment to be carried out by a team of experts.

The next chapter

The next chapter examines the mechanism at the core of post-construction regulation, the fire risk assessment. The assessment of fire risk was the mainstay in previous post-construction fire safety regulation as it is in current regulation. It is the responsibility for carrying it out that has significantly altered in current regulation. The chapter examines the process of fire risk assessment and who should be engaged to carry it out. It traces the transfer of fire safety knowledge, which originates in the pre-construction stage, and is intended to assist the duty holder in post-construction fire safety regulation but which, very often, is missing or incomplete.

Fire Risk Assessment

Introduction

Unless buildings are designed, constructed, and managed appropriately, situations can occur in which the occupants are at risk from fire. The design and construction of buildings is closely regulated so that, when a building is occupied and utilised, it is deemed to provide an acceptable level of safety for the occupants[44] (despite the fact that this level is rarely explicitly quantified). The supposition is that, if the building is occupied and utilised as the building designer envisaged (with adjustments made for subsequent alterations to the building or business process), then the threat of fire is adequately controlled and the building is sufficiently safe to be occupied.

An ideal situation would exist if the actual building user exactly matches the theoretical building user envisioned in the design, the reflexive user (Bardini and Horvath, 1995). In this hypothetical world, the actual user would utilise the building precisely as the building designer envisaged and would faithfully follow the script that is black-boxed into the design. For example, if a building has been designed to accommodate offices and the actual user occupies the building using it for the administrative functions necessary for a business, then the match is a good one and the occupation is more likely to match the safe environment envisaged by the designer than not. However, if the actual user occupies the building using it in a different manner or for a different purpose than the designer envisaged, then the match is less good. A less

[44]The phrase, *level of safety*, is disliked by fire safety engineers when applied to fire safety. This is most likely because it is a subjective and indistinct phrase, dependent on the probabilities of occurrence and consequence applicable only to the case in which it applies.

good match reduces the chance of achieving the safe environment envisaged by the designer with the result that the safety of the occupants is less assured. An example of this would be if a building that has been designed to be used as offices is instead used as a hostel, and the rooms originally designed as offices are turned into bedrooms. The building is not being used as the building designer envisaged and, in this example, it is likely that the safe environment, intended to give safe occupation of the building for use as an office, will offer less safe occupation when used as a hostel.

To facilitate the building occupier following the script, the pre-construction regulations provide for fire safety information to be transferred when the building is complete. The fire safety information is an attempt to explain the black-boxed components of the fire safety design in a way that can be interpreted, understood, and of use to the building occupier. The stated intention of providing fire safety information is to assist the building duty holder to meet her responsibilities under the post-construction fire safety regulations. This fire safety information thus constitutes a literal script that explicates the role of the building occupier in the functioning of the fire safety design. Reading this script provides the opportunity for the duty holder to pick up on and rectify any mismatches between the reflexive use of the building as envisaged by the designer and the actual use of the building.

Fire risk assessment

Scope of regulations

Post-construction fire safety regulation in the UK applies to any relevant premises (Regulatory Reform (Fire Safety) Order (2005, s.6) and Fire (Scotland) Act (2005, s.78)). The regulations facilitate the process of rectifying mismatches in the use of the building and the fire safety design by the requirement for a fire risk assessment. The purpose of the fire risk assessment, in being utilised as a tool to assist in managing a building, is to satisfy the regulations with ‘a formal, but logical and analytical, review of the fire hazards and fire risks, along with an examination of the fire precautions’ (Todd, 2008, p.76). Whereas the previous regulations typically required the Fire and Rescue Services to carry out the assessment of fire risk, that burden now falls on the duty holder (known as the responsible person in England and Wales).

Many types of premises are subject to regulation and the regulations have a wide scope. Some premises to which the regulations apply are newly-built buildings, some are buildings built more than a century ago, with the majority of premises being buildings built somewhere between the two extremes. The fire risk assessment, therefore, has to be a flexible tool, applicable to a wide range of different types of premises, situated in a wide range of different buildings, occupied by a wide range of different occupancies.

There is a standard for fire risk assessment but there is no standard fire risk assessment and, because of the subjectivity of the fire risk assessor, there is no guarantee that two fire risk assessors carrying out a fire risk assessment in the same premises on the same day would produce the same fire risk assessment. The differences might be attributable to the natural proclivities of the fire risk assessor as a result of bias, expertise, experience, and so on. Typically, a fire risk assessment will be carried out by an individual with a suite of biases, an indefinite quantity of expertise, a variety of experience, and by someone who needs to fulfil a contractual obligation profitably. As Hurst (1998, p.98) notes with regard to risk assessment in general: ‘It is not purely objective and the human dimension pervades risk assessment. The notion of risk assessment as a pure science must be abandoned’. So, unless a fire risk assessor guards against it, she will be subject to a whole range of human cognitive biases which have a direct influence on the way she behaves. She also may be subject to a delusion that she is more competent than she actually is, and she also may be worrying about the performance of the contract, and whether she is making sufficient profit.

These are influences that can have real effects on the outcome of fire risk assessments. For example, a large organisation, when considering its responsibilities towards post-construction fire safety regulations, has a number of options when fulfilling its duty to carry out fire risk assessments. Employing a fire safety adviser is one option, awarding a contract to a fire safety consultancy, is another. However, the bias, experience, and motivation of an employee may be quite different to those of a contractor resulting in a dissimilar fire risk assessment.

A significant difference, noted by one fire safety adviser, is that fire risk assessors working under contract will typically carry out a fire risk assessment that satisfies the available guidance, but will be quite rigid in their conclusions and fail to go out of their way to tailor the assessment to take into account any idiosyncrasies, such as particular characters or management styles, that may be present. Nor will they necessarily return, after a period of time, to make sure that their recommendations have been interpreted correctly and implemented effectively. However, an employee carrying out a fire risk assessment has several potential advantages over the contractor. The employee has the advantage of understanding the most effective risk controls because of their more informed knowledge of the building, characters, and management style. The employee also has the opportunity of re-visiting the location to investigate the impact of the recommendations after a sufficient period of time and to rectify them if they are proving to be unachievable. A contractor, not wanting to be accountable for the unintended consequences of a fire risk assessment, will be very rigid and unoriginal when considering the general guidance. An employee has the potential to be more creative and flexible when considering the guidance because of the greater knowledge and the opportunity to rectify the effects of an unintended consequence later on[45].

Provenance of fire risk assessment

Fire risk assessment represents a risk-based approach to workplace hazards and is the core methodology in support of the current post-construction fire safety regulations. Assessing risk in the workplace is not new and was a feature of former legislation, present in the Fire Precautions Act (1971), the Health and Safety at Work etc. Act (1974), and the Fire Precautions (Workplace) Regulations (1997). All three pieces of legislation featured a risk assessment, with the difference between them being the allocation of responsibility as to who would carry out the fire risk assessment. In the Fire Precautions Act (1971), it was the regulator that was required to carry out the assessment[46] but in both the Health and Safety at Work etc. Act (1974) and the Fire Precautions (Workplace) Regulations (1997), it was the duty holder (usually the employer) who was required to carry out the assessment.

In particular, the Fire Precautions (Workplace) Regulations (1997) marked a fundamental change in the regulation of post-construction fire safety because it adopted the performance-based self-regulation already in use in the Health and Safety at Work etc. Act (1974). In all premises not already designated

[45] Interview with a fire safety adviser: No.5: November 2014.

[46] The fire authority was the regulator for most premises designated under the Fire Precautions Act (1971) but for Crown Premises the enforcing authority was Her Majesty's Fire Service Inspectorate. For major chemical plants and other risks, described as 'special premises', the enforcing authority was the Health and Safety Executive.

under the Fire Precautions Act (1971)[47] the assessment was now required to be carried out by the duty holder. The situation changed again in 2006 when the Fire Precautions Act (1971) and the Fire Precautions (Workplace) (Amendment) Regulations (1999)[48] were replaced with the current post-construction fire safety regulations, the Regulatory Reform (Fire Safety) Order (2005), and self-regulation became the norm.

The underlying principles of these regulations are generally considered sound. As one fire safety advisor put, the regulations comprise a 'short compact document which is good legislation and is about basics', and is supported by 'accepted codes of practice, the British Standards to other documents that back it up ... it's good, it's a good basis'[49]. However, one obvious failing in the regulation is that there is no mention of the package of fire safety information required by the pre-construction regulations to assist the duty holder in carrying out their regulatory responsibilities (Approved Document B (2010, s.0.12, p.9) and the Building (Miscellaneous Amendments)(Scotland) Regulations (2013, s.3)). Logically, the post-construction regulations would not only draw attention to the availability of the information but would also point out its importance to the duty holder. It would also instruct or give guidance in how it should be used. Lacking this information will make it more challenging for the fire risk assessor to understand how the fire safety design was intended to work, particularly if aspects of it are black-boxed and opaque to casual observation.

[47] Premises designated under the Fire Precautions Act (1971) included, hotels and boarding houses which slept six or more people (inclusive of staff) (Fire Precautions (Hotels and Boarding Houses) Order, 1972, s.3), and factories, offices, shops and railway premises where more than twenty persons were employed to work or more than ten persons employed to work above or below the ground floor (Fire Precautions (Factories, Offices, Shops and Railway Premises) Order, 1976, s.4).

[48] The Fire Precautions (Workplace) Regulations (1997) were amended by the Fire Precautions (Workplace) (Amendment) Regulations (1999).

[49] Interview with a fire safety adviser: No.20: January 2015.

Purpose of fire risk assessment

The purpose of the fire risk assessment is clarified in the governing regulations. In England and Wales, it is to 'make a suitable and sufficient assessment of the risks to which relevant persons are exposed for the purpose of identifying the general fire precautions' (Regulatory Reform (Fire Safety) Order, 2005, s.9(1)). In Scotland, it is to 'carry out an assessment of the workplace for the purpose of identifying any risks to the safety of the employer's employees in respect of harm caused by fire in the workplace' (Fire (Scotland) Act, 2005, s.53(2)(a)). Viewed from a sociological perspective, the fire risk assessment is a mechanism that has two objectives: (1) to pick up on the philosophy behind the fire safety design inherent in the building, comparing what the building designer intended against what is actually in place, and; (2) to determine the steps that need to be taken to either maintain the function of the original fire safety design or, because of alterations to the building or modifications to the building usage, to determine what other steps need to be taken so as to reflect the safety considerations of the original fire safety design.

Methodology of fire risk assessment

A fire risk assessment works logically through a set of steps common to any risk-based approach to safety hazards. It ascertains the fire hazards in the premises, it identifies the people who may be at risk from the fire hazards, and it determines the fire risk by evaluating the likelihood and severity of the fire hazards having regard to the safety of the people who have been identified. Here, the competency of the fire risk assessor is key. For example, the risk may be associated with a particular time of day and this has to be appreciated and accounted for by the fire risk assessor: 'inspecting nursing homes during the day is a waste of time, it proves nothing because it's not when fires happen and it's not when you'll notice the problems. You've got to go at night. You've got to go at one o'clock in the morning'[50]. Experience tells this fire risk assessor that the risk differs according to the time of day, meaning that a conclusion for the completion of the fire risk assessment should only be drawn with a comprehensive knowledge of all of the circumstances.

Many buildings, in the UK, have been designed in accordance with the prescriptive building code and a fire risk assessor should then be able to understand how the building has been constructed. So, in the majority of circumstances a competent fire risk assessor should be able to make the correct judgement when assessing the fire risk[51]. In the minority of cases, however, where the building has been designed in accordance with the performance-based code, making the correct judgement is more difficult if the fire safety design is black-boxed in ways that make its functioning opaque to visual inspection. Thus, a fire risk assessor may make a mistake if they rely on the balance of probability and guess that the building has been designed to the prescriptive code when, in fact, it has been designed to the performance-based code. Because the consequences of such a mistake have not been considered, they will not be assessed, and are effectively ignored. So part of the methodology of fire risk assessment includes the importance of understanding and taking into account from the outset the specific design approach used in the design of the building.

For instance, the fire safety design for the building could rest heavily on the fact that a particular fire-resisting door is self-closing and will always remain in the closed position. In doing this, the building designer has placed an amount

[50] Interview with a fire risk assessor: No.4: November 2014.
[51] Interview with a fire risk assessor: No.15: January 2015.

of faith in the management of the building, that it will understand the critical nature of the door, that it will be vigilant in its maintenance of the door, and in its ability to remain closed. This, of course, would be the expectation in a well-managed building with an excellent management system but, perhaps, may be only an aspiration in a less well-managed building with a mediocre management system. In respect of this theoretical scenario, one fire safety consultant has commented that building designers prefer to use the prescriptive building code, because they know of the failings in their understanding of how buildings are managed, and using the prescriptive code helps guard against these shortcomings. Use of the prescriptive code means that the design should be at least as good as the majority of buildings designed to the same standard that have been occupied successfully for many years. Also, use of the prescriptive code means that an experienced fire risk assessor should easily be able to understand how the building has been constructed.

The development of performance-based building design using fire-engineered solutions is altering the situation. The margin of safety in the fire safety design that represents the difference between safe occupation of a building and unsafe occupation of a building, for example, has to be calculated in performance-based building design rather than assumed as it is in the prescriptive code. Because it is calculated, where practicable, this means that the margin of safety in the fire safety design can be reduced to a minimum whilst balancing the need for safety against the need for reducing costs and making profit. The process of reducing the fire safety design to a minimum inevitably means that operation of the black-boxed fire safety components become more critical. In the theoretical case of the self-closing door mentioned above the satisfactory performance of the fire safety design may depend on a well-managed building with an excellent management system. So, replacing a well-managed building with a poorly managed building, adversely affects the criticality of the functioning of the black-boxed fire safety components. Significantly, from the point of view of post-construction regulation, any black-boxing of fire safety solutions has the effect of increasing the likelihood of an unsatisfactory fire risk assessment which, in turn, reduces the likelihood of achieving the safe environment, and increases the risk for the building occupants[52]. Avoiding such an outcome depends on the fire risk assessor having expertise which is appropriate to the complexity of the fire safety design under consideration.

How the fire risk assessor carries out the fire risk assessment is important because it has to be commensurate with the approach inherent in the legislation. Regulation that stems from European legislation, as fire safety legislation currently does in the UK, is predicated on two approaches to risk. These are the prevention approach and the precautionary approach. The prevention approach was adopted in the European Economic Community in 1987 and the precautionary approach was added in the *Treaty on European Union (1992, Article 130r(2))*. The two approaches run side by side. The prevention approach is applied to risks that can be calculated or quantified thus allowing a proportionate decision to be made about risk control measures. The precautionary approach is applied to potential risks that defy calculation or quantification because the scientific evidence may be inconclusive, uncertain, insufficient, or potentially dangerous. These approaches are welcomed by some: 'one thing I do like is the way that the same language and the same approach used in the Health and Safety at Work Act has been mirrored in the [Regulatory Reform (Fire Safety) Order (2005)]'[53].

However, in the UK, the fire risk assessor must also apply the principle

[52] Interview with a fire safety consultant: No.23: February 2015.
[53] Interview with a fire safety adviser: No.20: January 2015.

of reasonable practicability[54], the UK's tempering of the absolute condition of the approach to risk prevalent in Europe. Reasonable practicability is the hard won principle that allows fire risk assessors in the UK to balance the cost of controlling the risk in terms of money, time, or inconvenience/loss of functionality, and the amount of risk that is being reduced. The concept is expressed in the phrase *so far as is reasonably practicable (SFARP)* used in the Health and Safety at Work etc. Act (1974, s.2) in reference to the level of risk that employees should be subjected to by their employers[55].

If the findings of the fire risk assessment establish that the risks are intolerable, then the presumption is that they must be reduced or removed. The findings of the assessment must be recorded, along with the measures recommended to control the risks: 'After a comprehensive fire risk assessment of the premises and work processes, and taking action, where possible, to reduce risks, the next step is to formulate a plan for what to do in the event of a fire. By taking account of the identified risks, this plan will ensure that the business responds in the best possible way' (FPA, 2015, p.10).

Amongst the wealth of published guidance dealing with the methodology of fire risk assessment there is one document, published by British Standards Institute as a publicly available specification (PAS)[56], that has the support of several organisations influential in the fire industry. This is favoured by practitioners as a reference document: 'My view is that [the standard offered by *Fire Risk Assessment Guidance and a Recommended Methodology (2012)*] is

[54]For more details on the concept of *Reasonable Practicability*, please see (HSE, 2001, pp.62-3).

[55]For details of the Chair of the Health and Safety Commission's defence of the principle of *reasonable practicability*, please see (Callaghan, 2006, Questions 228-230).

[56]A publicly available specification (PAS) is a document usually commissioned by an industry leader to enable the industry to respond to changing conditions and/or emerging needs. It can later be developed into an international standard. For more information see https://www.bsigroup.com/en-GB/our-services/developing-new-standards/Develop-your-own-fast-track-standardization-document/ (accessed on 15 Dec 2018).

a very good minimum that they set to stop anyone going below it. I developed a system at my previous place, that was based on first principles and I've looked at it and it matches quite closely with [*Fire Risk Assessment Guidance and a Recommended Methodology (2012)*]. It's a standard that everyone can refer back to'[57].

The duty holder has the responsibility for taking action but some fire risk assessors try to assist them in this process by allocating the recommended risk control measures a priority reference. For example, a recommendation given the reference A may mean that it is urgent and needs to be tackled first within a short period of time. The reference B means that the recommendation is not quite so urgent, and the reference C, less urgent, and so on. This is said to help the duty holder in setting budgets: 'we haven't got the money to do everything so what we've done is, we're doing the As first, then the Bs, then the Cs, and then there may be some other ones that are recommended as good practice'[58]. However, some sort of action on the part of the duty holder is considered imperative because 'if you do a fire risk assessment, they don't act on it, it can become a millstone around their neck'[59]. This is because if, following a fire incident, for example, the inaction is discovered, then enforcement is likely to take place and may be more severe because it indicates intransigence on the part of the duty holder.

Validity of fire risk assessment

The fire risk assessment is only valid for the point in time it is carried out along with the circumstances that prevailed at that point in time. All premises change, as time goes by, and any change could necessitate a review of the fire risk

[57] Interview with a fire safety adviser: No.19: Jan 2015.
[58] Interview with a fire risk assessor: No.10: Dec 2014.
[59] Interview with a fire risk assessor: No.10: Dec 2014.

assessment to reflect the changed circumstances. The fire risk assessment 'is a living document but it cannot remain valid for an unlimited length of time'[60]. It is likely to cease to be valid when, for example, a material alteration takes place, or a significant change occurs in the assumptions inherent in the fire safety design, or there is a significant change in the fire precautions. The validity of the fire risk assessment is dependent on an accurate reflection of the fire risk, and therefore, the fire risk assessment has to be reviewed whenever there are material alterations and the fire risk alters. For example, commercial and institutional buildings change at different speeds; commercial buildings have to adapt quickly because competitive pressure means that the businesses they house have to grow and expand; whereas, institutional buildings 'act as if they were designed specifically to prevent change ... to convey timeless reliability to everyone outside' (Brand, 1995, p.7). The legislation states that a review should take place if there is a reason to suspect that the fire risk assessment is no longer valid or if there has been a significant change in the matters to which it relates.

The process of fire risk assessment should involve continuous monitoring to determine the point when it becomes sufficiently invalid to require updating. The continuous monitoring aspect is important because, if the changes to a premises are gradual, they can become easily accepted and soon overlooked by the occupants. An ideal management system would be one that monitors and audits changes to the premises, providing regular information on which management decisions could be based. London Fire Brigade (2016) offer some suggestions of what constitutes significant change in a premises, including: (1) a new work process involving additional combustibles, ignition sources or changes to furniture layout or internal partitions; (2) an increase

[60]Source: https://www.ifsecglobal.com/reviewing-fire-risk-assessment-programmes/ (accessed on 7 November 2017).

in the number of occupants in the premises; or (3) occupying another floor in a multi-storey building. London Fire Brigade further state that these examples are not intended to be exhaustive but they do serve to highlight the interpretive flexibility and subjectivity of the phrase *material alterations*.

This subjectivity matters because gradual change can undermine fire safety and lack of adverse feedback (in the form of a fire or inspections by regulators) can allow the *normalisation of deviance* (Vaughan, 1999). The duty holder may be aware that the fire safety measures are being compromised, but be complacent about the significance of these changes. Where duty holders lack competence themselves (the majority of cases), they may not even appreciate that the changes are significant enough to require the fire risk assessment to be updated.

How to choose a fire risk assessor

Identity of the duty holder

Both the Regulatory Reform (Fire Safety) Order (2005, s.9(1)) and the Fire (Scotland) Act (2005, s.53(2)(a)) require that a fire risk assessment must be carried out and that it is the responsibility of the duty holder to make sure that the risk of fire in a premises is properly assessed. However, identifying the duty holder can be a challenge in itself. The regulations seek to identify the person having control of the premises and, typically, this is the employer: 'The employer is held by strict liability... and will always be held to be the "responsible person" where the workplace is to any extent under his control' (CFOA, 2015, p.22). Where there is no employer, the person defined as having control of the premises may be the occupier in connection with a trade, business, or other undertaking carried on in the premises. Or, failing those criteria, the owner of the premises would be held to be the duty holder (Regulatory Reform (Fire Safety) Order (2005, s.3) and the Fire (Scotland) Act (2005, s.54)). However, some scenarios can make identification even more challenging: ‘Investigating Officers may be told that Mr. X is the responsible person by Mr. Y who is the real responsible person but who is trying to evade liability. Mr. A may claim responsibility because he is fearful of Mr. B, and may lose his job or his lease if he doesn’t. Alternatively, all those questioned may hide behind the ‘Corporate veil’ of a large organization’[61].

It may be the case that the duty holder forgets that they are the duty holder because ‘they don’t come into work every day thinking about the consequences of fire or health and safety’[62]. This particular aspect is usually dealt with in a large organisation where there is a fire safety department whose job it is ‘to coerce, steer, remind, update, monitor all the time’ making sure that regulatory responsibilities are met[63]. However, this may not be the case in smaller organisations where ‘a manager of a factory will not have an understanding of certain things within his building until somebody calls’[64]. This is where the value of contracting a specialist fire risk assessor can prove beneficial but still leaves the question of who has the competence to carry out a ‘suitable and sufficient’ fire risk assessment.

Definition of competency

‘[I]n order to carry out competently a fire risk assessment, it is necessary (but not always sufficient) for the fire risk assessor to have a good underpinning

[61] Taken from *Evidencing the Responsible Person* available at http://www.firesafetylaw.co.uk/evidencing-the-responsible-person/ (accessed on 15 Dec 2018).

[62] Interview with a fire safety adviser: No20: January 2015.

[63] Interview with a fire safety adviser: No20: January 2015.

[64] Interview with a fire safety adviser: No.27: May 2015.

knowledge of the principles of fire safety. This includes a fundamental knowledge of the causes and means of preventing fire, a knowledge of the design of fire protection measures, an understanding of the behaviour of fire in buildings, and an understanding of the behaviour of people in fire' (Todd, 2006, p.20). Both the Regulatory Reform (Fire Safety) Order (2005, s.18(1)) and the Fire Safety (Scotland) Regulations (2006, s.17(1)) require that the person who carries out the fire risk assessment must be sufficiently competent. The definition of competency encompasses sufficient training, knowledge, and experience in the task that is being carried out, but, even though a person is competent, this does not absolve the duty holder of responsibility. The duty holder can delegate the task of fire risk assessment to an employee or an external contractor, but they cannot delegate the responsibility for the quality of the work. The duty holder has little defence against the production of an inadequate fire risk assessment by an incompetent contractor (Regulatory Reform (Fire Safety) Order (2005, s.32(11)(b)) and Fire (Scotland) Act (2005, s.75)) unless it can be shown that 'he took all reasonable precautions and exercised all due diligence to avoid the commission of such an offence' (Regulatory Reform (Fire Safety) Order (2005, s.33) and Fire (Scotland) Act (2005, s.72(9))). Notwithstanding, many duty holders choose to delegate the responsibility, and there is a growing market of individuals and consultancies who are willing to be contracted. The critical question is: how to choose a competent person to whom to delegate the task? Who will be able to correctly and empathetically understand the operation of the premises while faithfully reinforcing the building designer's expectations for premises that will most likely have altered in nuanced ways since the building was first occupied?

Who has competency?

Carrying out fire risk assessment is an unregulated ‘profession’ in which anyone can participate subject only to the perception of their own competence and, if necessary, the judgement of the court. The question of who has the competency to carry out a fire risk assessment has given rise to a national discourse into what constitutes competency in the assessment of fire risk, and how that competency can be demonstrated[65]. The desired outcomes are clear: ‘a fire risk assessor should be able to understand the requirements of [the standard that applies] and be able to make judgements based on what they see as to whether that’s appropriately managed or not, or that the precautions are suitable’[66]. However, the expertise and experience required to demonstrate such competence is less clear.

Although it can be argued that competency is ‘defined in health and safety legislation: knowledge, skills, and expertise’[67], not everyone has the appropriate expertise to carry out fire risk assessments. For example, the view of one fire safety enforcement officer was that: ‘A firefighter, on an appliance, could he do a risk assessment? No, he couldn’t because he doesn’t have an understanding of x and y, even though he’s worked for the fire service for years and years. Somebody working in fire safety? That depends on which part of fire safety he’s worked in. Take me, for example, could I do a fire risk assessment on a hospital? Probably not. I’m a fire engineer but I haven’t got the experience and knowledge for that’[68].

[65] For example, Hackitt (2017, p.17) identified that: ‘The means of assessing and ensuring appropriate levels of competence throughout the system are unclear and inadequate’, and Hackitt (2018, Recommendation 5.2, p.79) recommended ‘an overarching body to provide oversight of competence requirements and support the delivery of competent people working on [high-rise residential buildings]’.

[66] Interview with a fire risk assessor: No.16: Jan 2015.

[67] Interview with a fire risk assessor: No.10: Dec 2014.

[68] Interview with a fire safety enforcement officer: No.11: Dec 2014.

This points to contingent aspects of fire risk assessment expertise. Should a fire risk assessor be qualified, not only in the act of assessing fire risk but also in the category of premises in which they have received training? At present, fire risk assessor organisations offer qualification to fire risk assessors in two classes, proficiency in the consideration of life safety, the potential for loss of life in public and commercial buildings, and proficiency in the consideration of property protection, the potential for property and business loss in public and commercial premises (British Standard 9999, 2017). In addition, perhaps the qualification system[69] should separate candidates into more classes, for example, the consideration of life safety in premises with sleeping accommodation and the consideration of life safety in premises without sleeping accommodation? This could serve to emphasise the greater risk present in the former than the latter.

However, the increasing number of buildings with complex and/or black-boxed PBD fire safety features that are opaque to casual inspection means the list of attributes needed by a fire risk assessor now encompasses understanding the evolving design principles of fire protection measures. As more people enter the profession of fire safety engineering, bringing with them more ideas and innovation used in performance-based design, the effect is a burgeoning of building design characteristics. It is essential that fire risk assessors not only have an understanding of performance-based design and its differences with prescriptive codes, but also that they keep up to date with the innovative ways that building designers are evolving building design. This makes it critical that fire risk assessors have ‘an awareness of the limitations of [their] own experi-

[69]The Institution of Fire Engineers, for example, offers qualification and registration for fire risk assessors on their *Fire Risk Register* for either of two streams: life safety and property protection. Assessing the measures necessary for life safety is normally in support of regulatory compliance. Assessing the measures necessary for property protection is normally related to an insurance strategy in connection with a property and its assets (see https://www.ife.org.uk/Fire-Risk for further details (accessed on 15 Dec 2018)).

ence and knowledge' (Competency Criteria for Fire Risk Assessors, 2011, p.4) when looking at a fire safety strategy that they do not fully understand. Kruger and Dunning (1999) suggest that this may be a problem as, generally, people are not able to recognise their own lack of understanding.

It is clear then that the competence to carry out a 'suitable and sufficient' fire risk assessment will depend to some extent on the nature of the premises. Different expertise will be needed for more complex buildings, particularly if they involve fire safety designs that are black-boxed. For the very simplest building built to prescriptive regulations it may be enough to have what Collins and Evans (2007, p.18) term 'beer mat knowledge' that provides a check list of things to inspect (such as that exits are clear and the smoke alarm works). However, lacking the tacit knowledge obtained from experience, a fire risk assessor with *beer mat knowledge* would be vulnerable to mistakes due to variations that differ from the features set out in the check list. They would not understand the principles involved, nor would they have the experience of seeing many different types of building design and use, or of the ways that fires can start, spread, and endanger occupants. *Primary source knowledge* (Collins and Evans, 2007, p.22) would help a fire risk assessor better understand the principles involved, but even then they would lack the tacit knowledge - gained from experience and participation with other experienced practitioners - that would help in the practical application of this knowledge.

Tacit knowledge acquired from experience is thus important. As one fire risk assessor put it: 'a competent fire risk assessor gets a feel for what a building should look like, and when it doesn't look like that, you know what the differences are'[70]. Traditionally, a key source of such experience in fire safety has been found in the fire services. It may seem obvious to some duty holders that

[70] Interview with a fire risk assessor: No.16: Jan 2015.

a firefighter who, on retirement, has set themselves up as a fire risk assessor would make the ideal person to carry out their fire risk assessment. However, before they contract such an individual, they should remind themselves that they should be making sure they are contracting a suitably qualified person as they retain the responsibility for the credibility of the fire risk assessment. When questioned on this aspect, a fire safety manager commented; 'Well it's like any contractor, I would expect to see what qualifications they had, what experience they had ... people automatically think they must be good because they're ex-fire, but what formal qualifications have they got of pulling together a written risk assessment?'[71].

Even if the firefighter had spent a few years in the fire safety department of a fire and rescue service, there is no guarantee that they are competent fire risk assessors. An experienced firefighter will be skilled in extinguishing fires, and should have sufficient knowledge of common fire risks to carry out fire risk assessments for straightforward premises. Their tacit knowledge will thus take them beyond the level of beer mat knowledge, but more complex buildings with performance-based fire safety designs using innovative technology would be beyond their expertise. For these types of premises it would be desirable for a fire risk assessor to have specialist tacit knowledge of fire safety design based on a fire safety engineering degree and appropriate training in its application in fire risk assessment.

Internal or external fire risk assessor?

The duty holder can choose a specialist - an internal employee or an external contractor - to carry out the assessment on their behalf. However, '[n]o matter who carries out the fire risk assessment the duty holder retains the responsi-

[71] Interview with a fire safety manager: No.9: December 2014.

bility for ensuring the adequacy of that assessment' (A Guide to Choosing a Competent Fire Risk Assessor, 2014, p.3). In light of any uncertainty, seeking expert advice from a competent person is generally what the fire industry encourages when warning about the consequences of unsatisfactory fire risk assessments. However, the employees in the premises should be consulted as part of the process of risk assessment because they 'are often the best people to understand risks in the workplace and involving them in making decisions shows them that you take their health and safety seriously' (HSE, 2014, p.5).

It could be argued that the Government has favoured the strategy of using internal employees because of the amount of guidance it has published. This would fit in with the trend, prevalent at the time the current fire safety regulations were introduced, that the effect of regulations on business should be reduced to have as little impact as possible. The Fire Industry Association agrees and advocates that: 'In small simple buildings and/or where the fire risk is relatively low, it is possible that an employee may study the appropriate guidance document, and with access to external help and advice, conduct a satisfactory fire risk assessment' (FIA, date, p.6). In other words, with regard to fire safety they are relying on something that borders what Collins and Evans (2007) define as *beer mat* and *primary source knowledge*. This use of employees for fire risk assessment parallels what is found in other health and safety guidance. For example, *Managing for Health and Safety (2013, p.26)* insists that a risk assessment 'should be completed by someone with a knowledge of the activity, process or material that is being assessed' and that if 'an adviser or consultant assists with the risk assessment, managers and workers should still be involved.' This is undoubtedly sound advice but it does not overcome all potential obstacles. Although an employer or employee may be best placed to understand how the workplace operates and what might constitute a fire hazard in those circumstances, they may not understand the dynamics and behaviour of fire in buildings and/or the likely behaviour of people when threatened by fire. Ideally, the most qualified person to carry out a fire risk assessment on any specific premises would be someone who had sufficient experience and knowledge in how the premises operates plus sufficient experience and knowledge in the discipline of fire safety. In practice, of course, it is likely that such an individual would be a rare commodity which is presumably why Furness and Muckett (2007, p.86) advocate that: ‘A team approach is often the most effective way to ensure that all the appropriate risks have been identified’. They consider that a team of people made up from, for example, fire safety advisers, departmental managers, supervisors, workforce, and competent risk assessors would counteract the tendency for an individual’s biases, lack of knowledge, or unfamiliarity with the premises under assessment to affect the result. It may also be the case that risk control measures reached by a team of people associated with the premises would stand more chance of being received and implemented than those reached by an external individual fire risk assessor.

Simple and complex buildings

The guidance published by Government[72] indicates that an employee working within the premises may be sufficiently competent to carry out the fire risk assessment in premises that can be described as less complex or simple. However, the definition of complexity is fraught because it is highly subjective. The complexity that one person perceives as being within their capability to carry out a fire risk assessment may be different to another person, and the

[72] Fire safety law and guidance documents are available at https://www.gov.uk/government/collections/fire-safety-law-and-guidance-documents-for-business (England and Wales), and http://www.gov.scot/Topics/Justice/policies/police-fire-rescue/fire/FireLaw/GeneralGuidance (Scotland).

available guidance gives little assistance on how to address this. The guidance 'has been written to provide guidance for a responsible person, to help them to carry out a fire risk assessment in less complex [premises] ... More complex premises will probably need to be assessed by a person who has comprehensive training or experience in fire risk assessment' (Department for Communities and Local Government, 2006, p.5). The threshold between less complex and more complex is indistinct and is further confused by the way a building has been designed: 'Is a complex building a building that is fire-engineered or can a complex building be a [prescriptive] code-compliant building? A code-compliant building can be really complicated, such as, a theatre, a hospital, a shopping mall, etc. ... Also a simple building doesn't necessarily mean that it's a low-rise building . . . You might expect a complex building to have a fire strategy written for it which describes how the fire safety works, whereas for a simple building you probably wouldn't'[73]. Separating buildings into simple and complex seems to have been included in the guidance by an author who is speaking from experience. One who, perhaps, thinks that the definitions are obvious. But any attempt at definition immediately becomes subjective and so is unhelpful.

Showing sufficient diligence

The document *A Guide to Choosing a Competent Fire Risk Assessor (2014)* has been written to assist in the duty holder's dilemma and sets out the choices involved. The document deals with the issues of (1) whether or not the duty holder should carry out the fire risk assessment herself? (2) if not, then the question of choosing an individual who has the competencies that she needs must be answered. *A Guide to Choosing a Competent Fire Risk Assessor*

[73]Interview with a fire safety consultant: No.12: Jan 2015.

(2014) suggests that one way of answering this question is by exploring the candidate's experience. For example, have they carried out fire risk assessments in this type of industry before? Or, is it possible to ask former clients for references on their satisfaction with the work? Answers to these questions do not demonstrate competency but they may elicit information to assist in making an informed choice[74]. As well as assurances on the work ethic and past experiences of the fire risk assessor, *A Guide to Choosing a Competent Fire Risk Assessor (2014)* recommends that the duty holder should agree a contract in writing with the chosen candidate and that several quotes should be sought and evaluated before entering into a contract. The document goes further in suggesting that it is important for the duty holder to make sure that the chosen fire risk assessor is supported by an adequate management system. The duty holder needs evidence to demonstrate that, not only did she make efforts to secure a competent fire risk assessor, but she also made sure that the fire risk assessor's company administration was sufficiently effective to produce the fire risk assessment.

How competency can be demonstrated

Concern about the standard of self-regulation of those implementing the post-construction fire safety regulations, particularly in respect of the fire risk assessment, has led the industry to try to raise the general level of competence of fire risk assessors. A consortium of twenty-nine organisations consisting of representatives from relevant associations, federations, and institutions, including British Approvals for Fire Equipment (BAFE); Chief Fire Officers' Association (CFOA); Department of Communities and Local Government (DCLG); Institution of Fire Engineers (IFE); Passive Fire Protection Federation (PFPF);

[74] Interview with a fire safety adviser: No.20: Jan 2015.

Royal Institute of British Architects (RIBA); United Kingdom Accreditation Service (UKAS), and more, have come together and formed the Fire Risk Assessment Competency Council (FRACC). FRACC has collaborated in the creation and publication of competency criteria necessary for a fire risk assessor. The resulting document *Competency Criteria for Fire Risk Assessors (2011)* is comprehensive in most of the fields relevant to the assessment of fire risk in a typical premises; it includes a number of appendices which touch on, for instance, fire safety legislation, the behaviour of humans in emergency situations, adequate means of escape in case of fire, management of fire safety, and so on.

FRACC claim that competency can be demonstrated by: (1) being registered with a relevant professional body; or (2) being certificated by an accredited certification body (A Guide to Choosing a Competent Fire Risk Assessor, 2014, p.4). In pursuit of this, a number of private organisations offer registration for fire risk assessors, including the Fire Risk Assessors Certification Scheme (FRACS); the Fire Industry Association (FIA); the Institution of Fire Safety Engineers (IFE); and the Institute of Fire Safety Managers (IFSM). However, there is no single organisation that regulates the standards offered by the registration organisations and no surety that their standards are equivalent or demonstrate competence. Thus, there is no guarantee that the standard of a fire risk assessor registered with one organisation is commensurate with the standard offered by a competitor, or whether the standard offered by any of the organisations is sufficiently high to satisfy the regulatory requirement for competence. Of the organisations offering registration, some offer registration to an individual fire risk assessor and some to a company. Registration of an individual means that the registration organisation is satisfied with the competency of that specific individual and will register them for a specific period of time upon payment of a fee. Registration of a company operates slightly differently because it means that the registration organisation is satisfied that the company is sufficiently competent to maintain the competency of its own nominated employees.

The registration schemes claim that they enable fire risk assessors to demonstrate competence in their abilities. Proponents of the schemes are generally enthusiastic and content with the self-regulatory approach, but at least one fire safety enforcement officer, troubled by the standard of competence he was faced with when dealing with a fire risk assessor, has tried to challenge the legitimacy of the assessor's competency[75]. The challenge was unsuccessful because a procedure for such a challenge had not been considered necessary by the registration scheme and therefore did not exist.

The registration schemes were set up to cover a gap in the regulation of the discipline of fire risk assessment and to improve the standard generally, but because they are private organisations with a lack of scrutiny into their specific biases and how they are run, the schemes leave themselves open to criticism of regulatory capture. For example, it could be argued that the registration bodies exploit the situation for their own ends and, although there is no direct evidence of exploitation, there is also no monitoring of the situation that could produce such evidence. What is actually happening and how the registration organisations relate to each other currently remains largely unknown.

Another criticism is that because there is more than one registration body, that makes it difficult for a fire risk assessor to know which one is the best one to be a member of. It is also difficult for the client to know which registration body provides more assurance of a competent fire risk assessor. A fire safety adviser commented that 'it should be one body that is a part of all the individual

[75] Interview with a fire safety enforcement officer: No.29: Jun 2015.

bodies that people can be affiliated to that give you that certification'[76]. Such a solution would allow a standard to be set and monitored by a regulating body. This body would be able to make sure that any fire risk assessor qualifying from any of the registration bodies had achieved the same standard. Speaking of one of the registration bodies, a fire risk assessor commented that 'if someone's been through that process, they should be technically good enough to come to your site and know and ask the right questions, look at the right things and take regard of the right guidance documents. And, if they do it, there's a bloody good chance that they're going to get that right'[77].

However, it remains the case that fire risk assessors do not need to be registered to any of these bodies to practise their trade.

Fire safety information and the fire risk assessment

When a new building is constructed, regulatory requirements in the UK provide for the transfer of fire safety information from the pre-construction environment to the post-construction environment to assist the duty holder in operating the building safely (see the Building Regulations (2010, s.38) and the Building (Miscellaneous Amendments)(Scotland) Regulations (2013, s.3)). During the construction phase of a building, there are many issues that the building designer has to deal with, and many problems to solve in connection with both the design of the building and the regulations that govern construction. The resulting determinations involving fire safety become the fire safety knowledge embedded in the building design. The fire safety knowledge is critical to the formulation of a satisfactory fire risk assessment because it describes key aspects of the fire safety design of the building, including some that may be

[76] Interview with a fire safety adviser: No.5: November 2014.
[77] Interview with a fire risk assessor: No.13: January 2015.

black-boxed and thus opaque to the typical building user, and which embody the 'script' as regards the expected use of the fire safety design. The fire risk assessment needs to take account of the key aspects of fire safety design because a satisfactory fire risk assessment would focus on repairing and maintaining those elements on which safe occupation of the building depends.

The regulation for the transfer of fire safety information is present in both England and Wales, and Scotland with a similar intent but with slight nuanced differences. In England and Wales, the regulation refers to *fire safety information* and applies to building extensions in addition to buildings. It is intended to assist the duty holder 'to operate and maintain the building or extension in reasonable safety' (Building Regulations, 2010, s.38(3)(a)). In Scotland, the regulation refers to fire safety information as the *fire safety design summary* which applies to buildings but not building extensions, and it is intended to 'assist in the operation and maintenance of the building for fire safety purposes' (Building (Miscellaneous Amendments)(Scotland) Regulations, 2013, s.3(2)).

The Scottish requirement answers the question often asked by building designers in England and Wales with regard to how the fire safety information should be formatted. A template is provided in Scotland for the fire safety design summary that guides the author in summarising the fire safety design. The template consists of a series of direct questions that require to be answered either yes, or no, and then provides space for supporting information (see an example in Figure 4). Two completed examples are provided for guidance to give some direction as to how the information should be written and what depth of detail should be included[78]. There is a concern that summarising the technical details of a holistic fire safety strategy could distort it and that the

[78] Guidance about the fire safety design summary, examples, and downloadable templates are available online from http://www.gov.scot/Topics/Built-Environment/Building/Building-standards/ProceduralLegislation/firesafetydesign

inevitable technical jargon used in the summary could confuse and perhaps alienate the reader: 'There was just a fear that people would re-write the strategy within the [fire safety design summary] or be too technical and we need to remember who's reading it. It would be someone like a building manager or a headteacher who doesn't necessarily know what an FD60S[79] means?'[80]. Jargon within a profession is probably inevitable but, like all jargon, it acts as an obstacle to effective communication.

[79] FD60S and FD30S represent two of the most commonly found acronyms encountered in fire safety and both indicate a door, typically referred to as a *fire door* or a *fire-resisting door*. The doors are designed to prevent the passage of fire and smoke from one side of the door to the other in the number of minutes indicated by the digits included in the acronym. In addition, the letter S indicates that the door must be fitted with a *cold-smoke seal*.

[80] Interview with a fire safety engineer: No.18: 16 Feb 2015.

EXAMPLE ONE

FIRE SAFETY DESIGN SUMMARY		
Building Address: 64 Green Street Bigtown		**Building Owner:** A, N. Another 64 Green Street Bigtown
Proposed use of Building: Corner shop		**Building Warrant ref:** 120829/BW/LV Building Warrant application date: August 29, 2012.
Evacuation Methodology (1) Simultaneous √ Phased ☐ Progressive Horizontal ☐	**State number and width of any escape stairs:** None	**State fire resistance of building elements**(2)**:** Separating wall and floor have 1 hour fire resistance duration.
State occupancy capacity for each storey and the building(3)**:** Up to 2 people working in shop with potential for 10 members of the public.	**State number and capacity of final fire exits**(4)**:** Exit to front of shop	

Fire Safety Measures		**Supporting Information**
Do all 'travel distances' accord with building standards guidance? *If 'No' state alternative design information*	Yes √ No ☐	9 m from counter to final exit door
Are there any 'inner rooms' in the building? (5) *If 'Yes' provide information*	Yes √ No ☐	There is a small store to the right of counter but no inner room.
Is the building secured when occupied?(6) *If 'Yes' provide information*	Yes √ No ☐	Metal shutter opened then locked in place when building occupied
Does the building contain compartmentation / separation measures? *If 'Yes' provide information*	Yes √ No ☐	Shop separated by separating wall and floor from immediate neighbours.
Do any passive fire safety measures depend on activation of fire detection system?(7) *If 'Yes' provide information*	Yes ☐ No √	N/A
Has an automatic fire suppression system been installed?(8) *If 'Yes' provide information.*	Yes ☐ No √	N/A
Has a fire alarm / detection system been installed? *If 'Yes' provide category information*	Yes ☐ No √	Occupants will be alerted to outbreak of fire by a shouted warning "FIRE" by the person
Have additional fire safety measures been installed? *If 'Yes' provide information.*	Yes ☐ No √	No
Does the means of access, water supply and facilities for the Fire and Rescue Service accord with building standards guidance?	Yes √ No ☐	Parking available at front, rear and side of shop.
Is there dry / wet riser installed?	Yes ☐ No √	No riser installed
Are fire -fighting lifts installed?	Yes ☐ No √	No fire-fighting lift installed
Have any commissioning certificates and maintenance schedules been provided?	Yes ☐ No √	None
Excluding normal maintenance, provide information on any fire safety measures that rely on management actions or intervention? : None		
Other Relevant Fire Safety Information – None		

Figure 4 – Fire safety design summary (FSDS) (corner shop example)(Source: Scottish Government)

In England and Wales, the responsibility for administering the transfer of information from the pre- to the post-construction environment lies with the building control officer or an approved inspector[81], but the process is obfuscated by the wording of the regulation. In England and Wales, the regulation states that 'the person carrying out the work shall give fire safety information to the [duty holder] not later than the date of completion of the work, or the date of occupation of the building or extension, whichever is the earlier' (Building Regulations, 2010, s.38(2)). The obfuscation arises because at the time of building completion, it may not be clear who the duty holder is or when the building is likely to be occupied. This would certainly be typical in the case of buildings that are denoted as *core and shell* buildings, buildings that have been constructed with 'only base building elements such as a structure, envelope, and the heating, ventilation, and air conditioning (HVAC) system' (Yudelson and Meyer, 2013, p.14). However, it would also be true in most buildings because, although the occupying organisation may be known, the identification of the duty holder may not be apparent. In Scotland, where the fire safety design summary has an equal status to the building completion certificate, the problem is avoided; both documents have to be filed with the local authority building control[82] on completion of the building.

There is also a lack of clarity as to the administration of the regulation particularly in England and Wales: 'It doesn't actually say that the building control body is to take receipt of the fire safety information, [the regulation] says that the developer or someone carrying out the work needs to pass fire

[81] An approved inspector, governed by the The Building (Approved Inspectors etc.) Regulations (2010), can administer building regulations in England and Wales and offers an alternative private service in contrast to, and in competition with, the public service offered by the local authority building control.

[82] The Building (Approved Inspectors etc.) Regulations (2010) do not apply in Scotland. All building regulation in Scotland is administered by the local authorities.

safety information on to the [duty holder]. At no point in the wording of the legislation does it introduce building control into [the process]'[83]. The regulator (in this case, the building control officer) also has no written duty to satisfy herself that the fire safety information is fit for the purpose for which it has been produced. The regulation states that it is the responsibility of the person carrying out the work to meet the requirement. The person carrying out the work might be the architect, the builder, or the site developer and it is their responsibility, not that of the regulator, to give the fire safety information to the person who holds the regulatory duty when the building is complete: 'The main contractor says to [the regulator], "yes, we've provided that information". [The regulator does not] check the information, they don't see it and they don't check that it's been handed over. All they take is the word of the main contractor that it's been passed on'[84]. All the pre-construction regulator needs to do to record compliance with the regulation is to ask the person carrying out the work to tick a box or to put their signature on a form.

Figure 5 gives an example of the way that the regulation is administered in England and Wales. Charnwood Borough Council is a local authority in North-west Leicestershire and, as such, a regulator for building control in that area. As a regulator, it requires the person carrying out the building work to sign the form (shown in Figure 5) to verify that they have carried out their responsibility under the building regulations. There is no requirement for Charnwood Borough Council to check that the fire safety information is satisfactory or whether it achieves its purpose of directing the duty holder in how 'to operate and maintain the building in reasonable safety' (Approved Document B, 2010, p.9). Although the requirement is 'to ensure that sufficient information is recorded

[83] Interview with a fire risk assessor: No.12: 19 Jan 2015.
[84] Interview with a fire risk assessor: No.13: 19 Jan 2015.

to assist the eventual owner/occupier/employer to meet their statutory duties under the Regulatory Reform (Fire Safety) Order 2005' (Approved Document B, 2010, p.9), this requirement does not include checking that the 'information provided should include all fire safety design measures in appropriate detail and with sufficient accuracy to assist the [duty holder] to operate and maintain the building in reasonable safety' (DCLG, 2007, p.24). The responsibility for this is given to 'the person carrying out the work' (Building Regulations, 2010, s.38(2)) but it means that there is no regulatory check on the quality or consistency of the fire safety information produced.

Charnwood

To: Building Control,
Charnwood Borough Council,
Southfield Road,
Loughborough,
Leicestershire,
LE11 2TN.
Tel: 01509 634924/634757 Fax: 01509 260536
Email: building.control@charnwood.gov.uk

Fire Safety and Thermal Declaration
The Building Act 1984
The Building Regulations 2010

Building Control Require only this declaration not the documents.

1

Applicant's details as per Building Regulations application form.
Full Name:
Address:
Postcode: Tel: Fax:

4

Fire Safety Declaration
In accordance with The Building Regulations 2010 regulation 38 we hereby confirm that the information relating to fire safety has been provided to the responsible person and/or the Owner/User.
(Approved Document B 2006 Appendix G provides details of the information required)
Name:
Signature:
Position or representing:
Date:

5

Fuel and Power and Ventilation Declaration
In accordance with The Building Regulations 2010 regulation 39 and 40 we hereby confirm that the information relating to ventilation system use (39) and and/or Information about the use of fuel and power (40) has been provided to the Owner/User.
(Approved Documents F 2010 and AD L 2010 provides details of the information required)

Name:
Signature:
Position or representing:
Date:

Figure 5 – Declaration required by Charnwood Borough Council as evidence that the required fire safety information has been correctly transferred on the completion of a building

Essentially, the fire safety information should be the building designer's attempt to give sufficient description of those elements of the fire safety design that will assist the duty holder in managing the building safely. This can be particularly important if aspects of the design are black-boxed in ways that make their functioning opaque to the person doing the fire risk assessment. Yet the fire safety information is often absent when the fire risk assessment is carried out. It can be absent because it may not have been written or it may have been mislaid. Alternatively, it may be that it is present but is in some way incomprehensible to those trying to use it.

The process of creating, transferring, and receiving fire safety information resembles a linear model of communication comprising a sender, the message, and a recipient. In such a model, 'a speaker sends a message to a listener who receives the message. The speaker's role, then, is to encode the message, and the listener's role is to decode it. Encoding is the process of putting ideas into symbols, in this case into words that the listener ought to understand. Conversely, decoding is the process of attaching meanings to the symbols we see or hear' (Sellnow, 2005, p.11). In comparing the regulatory requirement of the transfer of fire safety knowledge with this view of a linear model of communication, the roles of the sender and recipient have been identified by the regulation. The contents of the message have been identified but not the methods of encoding and decoding. The method of encoding the message has been left for the building designer to determine but with little idea of the decoding abilities of the recipient. The method of decoding the message has been left to the recipient but with no preparation of how it should be decoded and with no prompt to even expect to receive a message. The linear model of communication has the disadvantage of being uni-directional, in that 'it fails to account for the receiver as an active participant' (West and

Turner, 2006, p.40). The recipient, the duty holder, is not seen as active and thus able to question and clarify the message, nor is there any mechanism to check that the message has even been received, never mind understood.

If duty holders do not have access to the fire safety information in a useful form then this is liable to impede their ability to produce a *suitable and sufficient* fire risk assessment because this information can help elucidate the script embedded in the fire safety design. This script constitutes the material enactment of the 'framework of action together with the actors and the space in which they are supposed to act' (Akrich, 1992, p.208) that the designer has envisaged will produce a safe building environment. Socio-technical systems are designed with a particular view of how they will work in which 'technological objects enable or constrain human relations as well as relationships between people and things' (Oudshoorn and Pinch, 2005, p.9). Thus to some extent the effectiveness of a fire safety design 'relies on the designer having an idea of the product's intended user, including, for example, their identity and characteristics' (Wade et al., 2016, p.5).

For example, the general assumption for an office could be that it is occupied for around twelve hours during the day by people who are awake and alert, whereas, the assumption for a hotel could be quite different. A hotel could be occupied for around twelve hours during the night by people who are asleep and not at all alert. The building designer has to make determinations based on assumptions such as these as well as other characteristics. For instance, the occupiers of both scenarios could be made up of any combination of different types of people: people who may be young or old, fit or unfit, capable or incapable. The fire safety design has to based on many assumptions that account for the putative user so that the building designers can make the determinations they need to make. Determinations about, for instance, the amount of time needed for occupiers to become aware that there is a fire emergency, to react to that awareness, and to respond by removing themselves to a place of safety. This means that there is an expectation built into the design that the occupiers will follow the script intended by the designer and will act out their role accordingly. It therefore follows that it is desirable to provide information that helps the occupier to behave in harmony with the script if the fire safety design is to be most effective.

If the fire safety information is unavailable for any reason, then the fire risk assessor must carry out the fire risk assessment without it. This inevitably means that the fire risk assessor is speculating about the intended operation of the fire safety design and the scripted role of the occupier, and thus the expectations that the designer had with regard to the behaviour of the building user. If the building has been constructed to a performance-based design, a speculative approach may prove to be particularly inadequate. Further, if the fire risk assessor is also speculating about other elements of knowledge necessary for an adequate assessment, such as the culture and operation of the premises under assessment, the adequacy of the assessment may be seriously in doubt.

Therefore, the fire safety information is as critical to the fire risk assessment as is the ability of the fire risk assessor to read, comprehend, and utilise it. Not only is it critical but, because of the continuing rise in numbers of buildings built, or partially built, using performance-based design, the fire safety information is becoming more, rather than less, critical.

Without prior knowledge, it can be difficult for a fire risk assessor to understand the precise reason that a piece of fire equipment has been installed in a building. An example of this is where a fire safety adviser was asked if a sprinkler system could be decommissioned and removed from one of a local authority's buildings. The local authority was spending £5000 per year maintaining the diesel engine that powered the sprinkler pump and it wished to make a saving on that cost; decommissioning the sprinkler system would remove the need for maintaining the pump. The fire safety adviser was unable to reach an informed decision because of the absence of the required fire safety information despite making considerable efforts to retrieve it[85]. Thus he could not ascertain the effects of de-commissioning the sprinkler system and removing it from the black-boxed fire safety design.

If the fire risk assessor could not accurately deduce the purpose of the sprinkler system as envisaged by the building designer, he could not determine the effects of its removal. It occurred to the fire risk assessor that the sprinkler system could have one of two purposes; 1) to assist in saving life in the event of a fire by protecting the means of escape for some or all of the building users; or 2) to assist in protecting the local authority's assets embodied in the building itself and its contents. Determining which of these purposes without the original design information that explained the roles played by the components of the black-boxed fire safety design or the expectation placed on the building users was just speculation. A wrong determination could result in altering, or even negating, the safe environment that the black-boxed fire safety design was supposed to create.

Notwithstanding the above, not all fire risk assessors place such importance on access to the fire safety information. Discussing a specific building, a fire risk assessor commented, 'I've no idea what the design parameters for fire safety were for this building, but that doesn't matter. I look at it from the point of view of somebody in this building trying to get out in an emergency,

[85] Interview with a fire safety adviser: No.27: May 2015.

this is what would happen in a fire situation'[86]. Such an approach may be acceptable for a fire risk assessor with long experience if the building has been designed according to prescriptive guidance but raises a question if the approach is being applied to buildings that incorporate bespoke performance-based design fire safety solutions. It is entirely possible that a building could incorporate a range of black-boxed fire safety design features that are not obvious or that there may be special features in the building construction that need consideration. Without reference to the original fire safety information these could be easily overlooked. Thus one fire safety engineer expressed a note of caution about the fragility of the assumptions made by fire risk assessors as buildings containing fire-engineered solutions become more prevalent as time goes by: 'With the current development of fire engineering, I think there can be hidden fire safety principles that you don't know about and that you wouldn't know about unless you had the information in the fire strategy'[87]. If correct, this indicates that unless the fire risk assessor keeps up with the pace of technology in the fire industry, she could be faced with black-boxed components that she has little or no knowledge of.

The creation of fire safety information is a pre-construction regulatory requirement but there is no matching post-construction regulatory requirement for receiving and utilising the fire safety information. Consequently, there are duty holders who are unaware of the fire safety information that is meant to assist them because they know nothing of its existence. In response to a question put to a fire safety manager about their use of the fire safety information following a major alteration to the premises[88], the response was surprise

[86] Interview with a fire risk assessor: No.4: Nov 2015.
[87] Interview with a fire safety engineer: No.22: Feb 2015.
[88] The major alteration to the premises involved the combining of two adjacent identical buildings as part of an expansion to the business. An atrium was constructed as part of the new construction producing a notably impressive reception area.

because they had no knowledge of it: 'I've never had reason to even look for it; even when I reviewed the fire risk assessment, I never saw any reason to go and look for this other information'[89].

Summary

The fire risk assessment is at the heart of post-construction fire safety regulation but if it stands in isolation from the evolution of fire safety knowledge in the life of a building, this reduces the chance of effective regulation. Three main factors appear critical to the operation of the fire risk assessment as a mechanism for regulation. First, and most importantly, fire risk assessments need to be carried out by people with a level of competence appropriate to the premises and its fire risks, but it is not clear how this competency can be assured. Second, at least for some premises, the ability of the assessor to carry out a suitable and sufficient fire risk assessment depends on the availability of the fire safety information used in the building design. Finally, such a system based on self-regulation needs regulatory oversight to police infringement, and this is provided in this case by the use of the fire safety audit, as will be described in the next chapter.

Next chapter

The next chapter illustrates how enforcement of post-construction regulation of fire safety works in practice. It examines a variety of cases which have been subject to regulatory enforcement through different circumstances. It demonstrates that enforcement of post-construction regulation is inconsistent, varying greatly between different Fire Authorities, and infringements are often only discovered serendipitously through intelligence gained from operational

[89] Interview with a fire safety manager: No.9: Dec 2014.

firefighting crews and other agencies. Case studies of fires highlight a number of ways in which the current regulatory system failed to ensure fire safety for building occupants and users.

Regulation in Action

Introduction

Because major fires are infrequent, and often dependent on the occurrence of a particular chain of events, it is important to look more broadly for evidence that post-construction fire safety regulation in the UK may be sub-optimal. The following chapter (Chapter 7) will draw on a wide range of interviews with practitioners that highlight widespread disquiet within this field. This chapter brings together two other forms of evidence: analysis of fire and rescue service data that details their enforcement activities; and some of the main cases where specific infringements (some involving fires and some not) have led to legal rulings and/or major enforcement actions.

A risk-based programme of auditing and inspection formulated by a fire and rescue authority is intended to make sure that premises considered most at risk are checked at appropriate intervals (CFOA, 2009). Notwithstanding, failures in the management of fire safety in premises can be brought to the attention of the enforcing authorities in various other ways. These can include: the occurrence of a fire in a premises bringing to light obvious or potential breaches of regulation to the attending fire crew; an allegation of regulatory breach in a premises from a member of staff, or a member of the public, contacting the enforcing authority; a regulatory breach suspected by an enforcement officer from a different agency, and so on. Prompt and consistent response to intelligence suggesting regulatory breaches assists in strengthening relationships with other agencies, partners, and the community in general.

With regard to the enforcement of post-construction fire safety regulations, there is no prescription for the regulatory approach. Each fire and rescue authority has discretion to set its own regulatory policy as made explicit in its integrated risk management plan (Fire and Rescue Services Act, 2004; DCLG, 2008a,b). Fire and rescue authorities are expected to formally appoint enforcement officers and to devise a programme of auditing and inspection. Enforcing authorities are permitted to carry out audits, issue enforcement notices, and prohibit the use of premises, wherever they deem it necessary to do so within their area of administration. Enforcement officers are directed by Government guidance in the principles of good practice and regulation and, in doing so, they are accountable to the democratic processes of the elected members of the fire and rescue authority (DCLG, 2007; BIS, 2013; BRDO, 2014; CFOA, 2015). The enforcement policy of a fire and rescue authority involves devising an auditing and inspection programme that concentrates on those in the community considered to be most at risk from fire in premises[90]. This means that the assessment of risk by the fire and rescue authority in one jurisdiction may be different from the assessment of risk by the fire and rescue authority in another jurisdiction. Also the regularity of audit and inspection may differ from one authority to another for the same reason. Variance in the regularity of audit and inspection between different fire and rescue authorities can be seen in Figure 6, which shows data collated by the Chief Fire Officers' Association (CFOA) in respect of the enforcement activity relating to the number of audits carried out by the fourteen fire and rescue authorities in Family Group 4.

The term *Family Group 4* refers to one of the five family groups that the fire and rescue authorities have been split up into for the purpose of compar-

[90]However, these premises do not include those defined as single family dwellings because such premises are exempt from post-construction fire safety regulation. The risk from fire in single family dwellings is mitigated by various partnerships, procedures, and initiatives under a separate community fire safety policy determined by each fire and rescue authority.

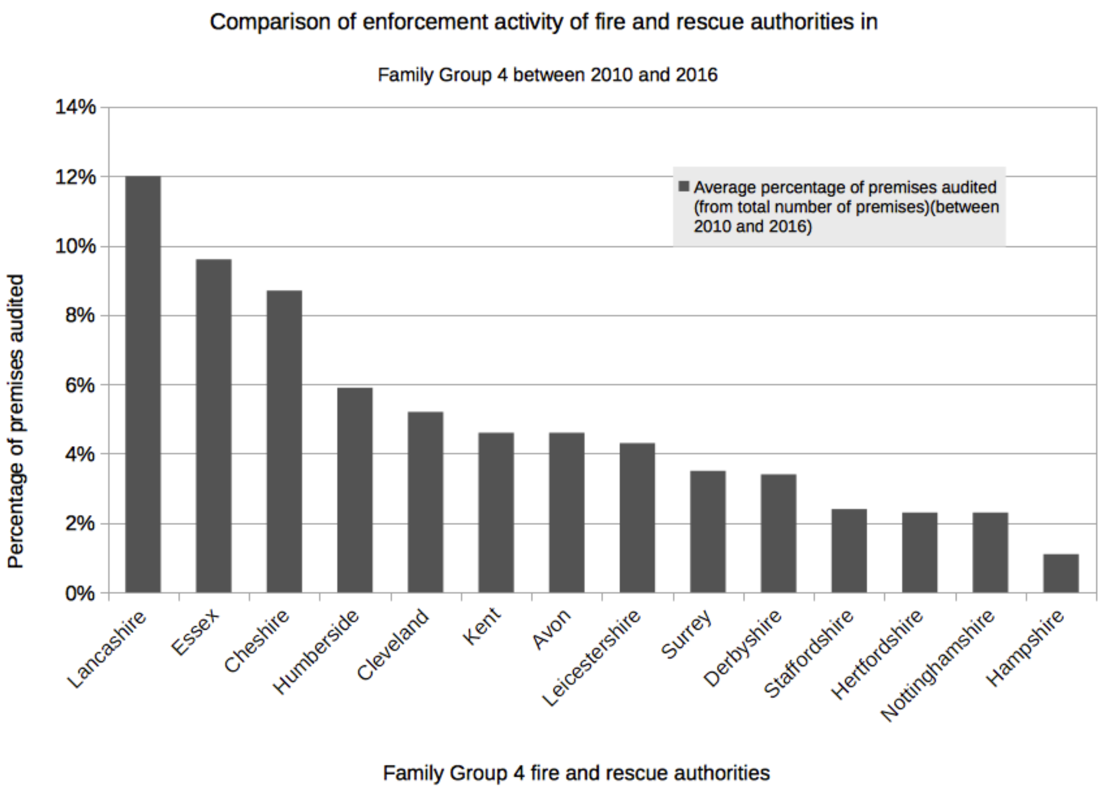

Figure 6 – The average percentage of premises audited between 2010 and 2016 (source: UK Government)

ison and benchmarking[91]. Comparison of local, fire, and police authorities in terms of economy, efficiency, and effectiveness, administered by the Audit Commission (Audit Commission, 1995a,b, 2000), was provided for in the Local Government Act (1992, s.1). The forty-five fire and rescue authorities in England (excepting the Isles of Scilly Fire and Rescue Authority[92]) have been split up into five groups; Family Groups 1 to 5. The five groups contain fire and rescue authorities that reflect similarities in the geographical areas they

[91] Benchmarking: the comparison of significant indicators of performance in one organisation with the same indicators in similar organisations. Benchmarking enables management planning to be informed by realistic evidence-based decision-making.

[92] The Isles of Scilly are part of England, as is the Isle of Wight. Islands such as, for example, the Isle of Man and the Channel Isles differ in this respect because they are described as Crown Dependencies. A Crown Dependency is a territory that is a self-governing dependency of the British Crown but which does not form part of the UK (source: Ministry of Justice, UK Government).

administer based on key factors such as: the mixture of rural and urban areas, and the level of deprivation present in the populations. Family Group 5, for example, has seven members which are the seven fire and rescue authorities administering metropolitan areas in England and Wales[93]. Because these administrations are so much bigger, in terms of their key factors, than the majority of administrative areas in England and Wales, it would be unwise to contrast them against any of the smaller administrative areas. Family Group 4, made up of the members indicated in Figure 6, has the largest number of members of all the family groups, and so provides a good opportunity for comparison for the purposes of this thesis.

In Figure 6 the number of audits carried out for each of the six years of data has been added together and shown as a percentage of the total number of premises that could potentially be audited within each area of jurisdiction[94]. Figure 6 shows that Lancashire Fire and Rescue Authority has been the most active fire and rescue authority in terms of carrying out fire safety audits during the six year period, while Hampshire Fire and Rescue Authority has been the least active. The chart also indicates that only a small percentage of the total number of premises that could potentially be audited, have been audited. The enforcement policy of each fire and rescue authority sets out how that small percentage of premises is identified. For example, Lancashire Fire and Rescue Authority have targeted their inspection programme 'at high risk buildings and where fire safety management is known or suspected to be poor' (LFRS, 2013, p.15), while Hampshire Fire and Rescue Authority have targeted premises

[93]Greater Manchester, London, Merseyside, South Yorkshire, Tyne and Wear, West Midlands, and West Yorkshire are the seven metropolitan fire and rescue authorities in England and Wales.

[94]Data in respect of fire safety audits is taken from Fire Statistics Table: 1202 (available online at https://www.gov.uk/government/statistical-data-sets/fire-statistics-data-tables) (source: UK Government).

most at risk ‘according to seasonal and demographic changes’ (HFRS, 2007, p.2).

As well as differences in the performance of fire and rescue authorities with respect to the number of audits carried out, there are also differences in the results of those audits. In Figure 7, one line of results represents the number of audits that were considered to be satisfactory, while the other line of results represents the number of audits that were considered to be unsatisfactory. The total of the two percentages adds up to 100%, indicated by the mirror image of the lines of results. However, the results are not as expected. The similarities present in each of the fourteen members of Family Group 4 create an expectation that their performance in fire safety enforcement would also be comparable. The expectation would be that the data would reflect a similar result for each fire and rescue authority provided the policy of enforcement was being applied in each fire and rescue authority in a similar manner. Clearly, this is not the case because, of the two extremes identified in Figure 6, Lancashire Fire and Rescue Authority audits, on average, 12% of premises while Hampshire Fire and Rescue Authority averages 1%. But, as shown in Figure 7, those two fire and rescue authorities are side by side at one end of the chart, displaying very similar results in the number of audits that are found to be either satisfactory or unsatisfactory. This is interesting because it appears to show that the two fire and rescue authorities, Lancashire Fire and Rescue Authority and Hampshire Fire and Rescue Authority, demonstrate a similar standard of performance in Figure 7 but not in Figure 6. One question that this observation raises is: why does one fire and rescue authority feel it necessary to carry out a significantly greater number of fire safety audits than another if they are both achieving similar results in their enforcement activity?

Another expectation of the results in the chart in Figure 7 is that one line

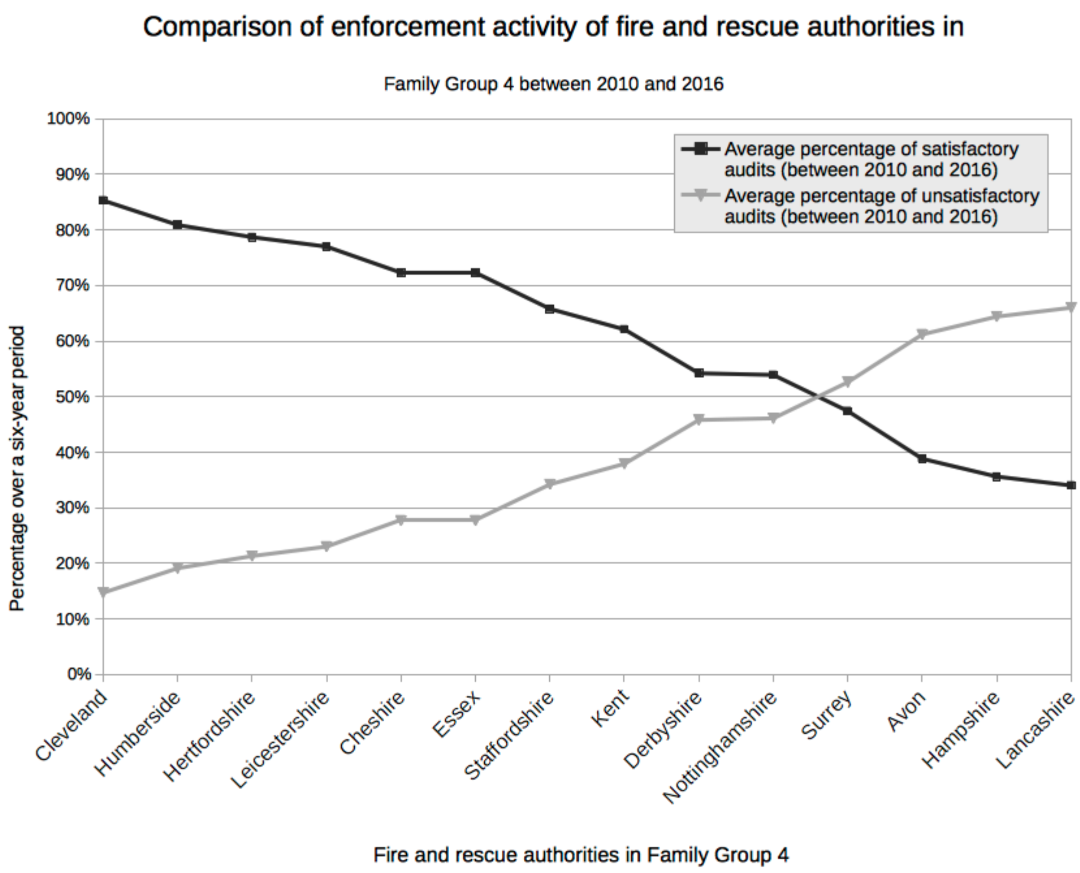

Figure 7 – The average percentage of satisfactory and unsatisfactory audits between 2010 and 2016 (source: UK Government)

on the chart would be parallel to the other. The expectation would be that if each fire and rescue authority were applying the same standard of enforcement consistently, the result would be a similar number of satisfactory and unsatisfactory fire safety audits. That the two lines are not parallel indicates this is not the case.

As regards consistency, there is no demand for the fire and rescue authorities to be consistent in the application of their regulatory responsibilities but there are expectations in the form of priorities and objectives set by Government in the national framework document (Fire and Rescue Services Act (2004, s.21) and Fire (Scotland) Act (2005, s.40)). Inconsistency in the application of their regulatory responsibilities could lead to calls of unfair regulatory enforcement by the fire and rescue authorities. A perception of unfair enforcement of duty holders under the post-construction fire safety regulations could lead to comparisons with the unfairness associated with the treatment of patients by the health authorities. The perception of unfairness associated with the treatment of patients by health authorities originates from the way in which a member of the public may or may not be able to access medical treatment. The term, *postcode lottery*, is an expression used (usually disparagingly) to describe variations in the local availability of nationwide medical services and was one of the main triggers for the *Calman-Hine Report* on the rising incidence and prevalence of cancer (Calman and Hine, 1995), which investigated the assertion that 'where you live dictates where you are treated, which in turn dictates how you are treated, and this in turn affects whether you survive' (Munro, 2010, p.213).

Figure 7 suggests that a similar case may be made against the fire and rescue authorities, implying that each fire and rescue authority may have a different attitude towards regulatory compliance. The data suggests that a company or business is more likely to receive regulatory attention in the area administered by one fire and rescue authority than it is in another. For example, if you are a duty holder in the area administered by Lancashire Fire and Rescue Authority, an argument could be made to the effect that you are more likely to receive regulatory attention than in any of the other thirteen areas of administration in Family Group 4.

The data raises other questions. Figure 8 shows the number of premises that were initially determined as unsatisfactory but were later found to be satisfactory following enforcement activity. The chart indicates a wide disparity in this respect between the fourteen members of Family Group 4, yet the expectation would be that all premises should be determined as satisfactory following enforcement activity.

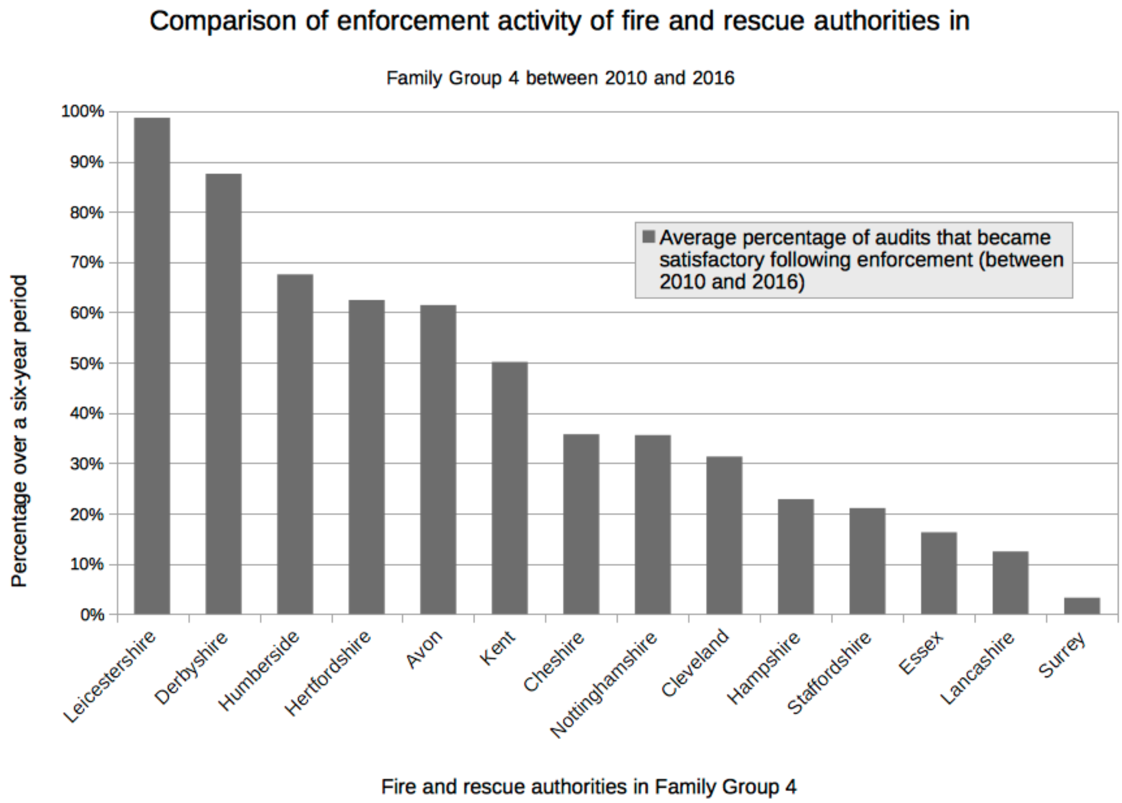

Figure 8 – The average percentage of audits that become satisfactory following enforcement activity between 2010 and 2016 (source: UK Government)

Generally, the process of fire safety enforcement to turn an unsatisfactory premises into a satisfactory premises conforms to the following path. Initially, a decision with regard to the necessary enforcement activity is arrived at via the fire safety audit to determine the level of enforcement necessary to raise the standard of fire safety in the premises. The process then goes on to monitor and direct the work until a satisfactory standard has been achieved. Success is measured by a satisfactory result in a further fire safety audit. The result shown for Leicestershire Fire and Rescue Authority in Figure 8 (just less than 100%) would fulfill the expectation. This raises the question of why do the other fire and rescue authorities not show a similar result? For example, why are the majority showing less than 50% and, in particular, why has Surrey Fire and Rescue Authority only achieved success in such a small percentage of premises? It is difficult not to reach the conclusion that the regulatory regime suffers from an inconsistent level of oversight.

In summary, analysis of data obtained from the Chief Fire Officers' Association (CFOA) points to marked inconsistencies in enforcement activities and outcomes. Although there may be variations in the types of premises covered by different Fire Authorities in Family Group 4, it is unlikely that this can explain the level of variation in enforcement. Instead, these variations in enforcement, and particularly the large variation in outcomes, indicates that many premises are left to their own devices when it comes to the implementation of post-construction fire safety regulations. The general consequence of this is that the achievement of a *suitable and sufficient* fire risk assessment, and the implementation of appropriate fire safety measures, will for many premises depend entirely on the competence of the duty holder and their chosen fire risk assessor. Where buildings are complex and/or designed with black-boxed fire safety technologies, adequate safety may depend on whether the fire risk assessor has the appropriate expertise, and that in turn depends on how well this expertise is regulated. As described in Chapter 5, there are good reasons to doubt the effectiveness of this self-regulation. However, because serious fires are relatively uncommon (due not only to improved building design, but also other factors including the regulation of household goods and the increasing use of smoke alarms) failings in post-construction regulation are only occasionally exposed. It is thus important to document and analyse cases where any such failings have come under public scrutiny which typically happens when infringements come to light that are serious enough to merit legal action.

Determining a satisfactory standard of fire safety

When looking for clarification of the applicable standard required of a fire risk assessment, the courtroom is the ultimate arbiter for specific cases. Courts examine evidence in cases brought before them sometimes in the light of a fire incident, but also at times when a fire has not even occurred. Each case is different and each case sets a precedent that may be used in future considerations, but this is not to say that the adjudication is the only conclusion that could have been made. For example, there may be many explanations available for a case where a fire has occurred in a premises and people have died or have been injured as a result. The deaths and injuries may have been the result of an inadequate fire risk assessment but, equally, they may have been the result of an inadequate evacuation strategy formulated from an adequate fire risk assessment. The factors involved could include insufficient understanding of the fire safety design due to a lack of relevant expertise among key actors such as the fire risk assessor or the duty holder, or an unconscious volition to self-regulate in a way that suits the business enterprise rather than the occupants of the building.

In the cases where no fire has occurred and the fire risk assessment has been brought to the notice of the court, however, the only explanation can be that the court has determined, on the available evidence, that the fire risk assessment was not of the correct standard. This would mean that, the court has decided that it was not possible to formulate an adequate strategy from the findings of the fire risk assessment. An adequate strategy would be one that was reasonably capable of protecting all occupants of the premises from harm when a fire occurs. The court will have determined this based on the perceived competence of the prosecution argument centring on evidence from the fire safety audit. That this can happen based on a theoretical argument is a testimony to the power of the fire safety audit and its presentation in court by the enforcing fire and rescue authority.

A fire safety audit can lead to enforcement action but sometimes it becomes part of an investigation into the cause of a fire or an inquiry into a fatality. The format and guidance associated with fire safety audits means that evidence gathered for prosecution under current fire safety regulations is always gathered in a consistent manner (CFOA, 2009). A consistency in the manner that evidence is gathered assists with its credibility when tested in court. The fire and rescue authorities plan to carry out audits according to their enforcement policies using their available resources, and for a variety of reasons. The reasons could include: (1) where a premises is inspected because it becomes part of an investigation into the cause of a fire which may or may not have resulted in fatalities or injuries; (2) where a premises is inspected because of concerns expressed by a firefighting crew who have observed regulatory breaches at an emergency incident; (3) where a premises has been inspected because of concerns expressed by other agencies who have observed regulatory breaches during their own enforcement processes.

The following cases constitute a sample of the most serious infringements of the regulations that have come to light in recent years. In sum, these cases reinforce the findings derived from analysis of the CFOA data, in that many of the cases only came to light through serendipitous circumstances unconnected to the normal regulatory procedures. They thus appear to demonstrate a clear failing in how post-construction fire safety regulations were designed to work.

Determinations made in the courtroom should be monitored and analysed to make sure the regulations are achieving their inherent ideals. But analysis is not easy, for instance, if there are many prosecutions, does this demonstrate that the regulation is too overbearing or that it is too acquiescent? Are duty holders failing to understand their roles with respect to the black-boxed knowledge? Has the distribution of expertise amongst key actors gone awry? Does self-regulation represent the ultimate example of being able to suit yourself? Monitoring and measurement are crucial but so also is the analysis of the findings because therein lies the evidence that the regulations (or the manner in which they are enforced) may need to change to be more or less rigorous.

There are other criteria to be heeded in regulation compliance. For instance, in carrying out the fire risk assessment, considerations that have previously led to a change in the regulations and/or are known to be problematic, should also be taken into consideration. Is there sufficient expertise involved in assessing fire risk? Shortcomings apparent in expertise, such as the expertise asymmetry that undermines the regulator's ability to regulate in the pharmaceutical industry, are also present in the fire safety industry (Spinardi, 2016). In fact, there are several characteristics of expertise that can act to undermine the effectiveness of fire safety regulation besides the differences between various regulatory actors; the expertise of the self-regulator (the duty holder); the expertise of the fire risk assessor (typically a supervised external contractor); the expertise of the fire safety enforcement officer (a reducing resource as officers trained and experienced in carrying out former prescriptive regulations are replaced with less trained and less experienced officers).

Lakanal House tower block: Enforcement following fire fatalities in a residential building

One of the most notorious fatal fires in recent UK history (given extra resonance in the light of the Grenfell Tower fire) occurred at Lakanal House, Sceaux

Gardens Estate, Camberwell, London on 3 July 2009, resulting in six deaths and sixteen injuries. The investigation into the fire revealed serious breaches of the fire safety regulations. The incident attained national notoriety due to the manner of the deaths and the discovery that a public organisation, a local authority, was in breach of fire safety regulations because it had not complied with the post-construction fire safety regulations. The local authority had failed in its self-regulation of fire safety by not carrying out fire risk assessments on its residential building stock.

The fire incident occurred almost three years after self-regulation had been introduced and drew attention to the reality that some housing providers were not treating their regulatory responsibilities seriously. Evidence was gathered in respect of the breaches in fire safety regulations alongside the investigation to discover why the fire safety design had not performed as expected. The fire had behaved erratically and unpredictably, and the advice for residents to *stay put* in their flats rather than evacuate the building had proved fatally incorrect.

Typically, the philosophy of the fire safety design in such a building is based on a fire resistant compartment (i.e. a flat) that offers a barrier shielding those inside a flat from a fire in another flat elsewhere in the building. The expectation of the original building designers was that provided the fire safety design was constructed properly and the components maintained adequately it would be safe for occupants to *stay put* in their flat for a defined period of time. The expectation is that the period of time would be sufficient for the fire to be spotted by the occupier or a third party, assistance requested from the fire and rescue service, and the incident attended and dealt with before the heat and smoke broke through the fire-resistant barrier into a neighbouring flat. This *stay put* approach is '[a]n evacuation strategy based on the principle that only the residents of the flat of fire origin need escape initially, while other residents may remain in their own flats' (LGA, 2012, p.180). According to the Local Government Association: 'This principle is undoubtedly successful in an overwhelming a number of fires in blocks of flats. In 2009-2010, of over 8,000 fires in these blocks, only 22 fires necessitated evacuation of more than five people with the assistance of the fire and rescue service' (LGA, 2012, para.12.1, p.20).

The cause of the fire, the source of ignition, in Lakanal House was attributed to a defect in a faulty TV in one of the flats. The defect ignited the TV and then ignited other combustible items in the flat until all the combustible materials in the flat were on fire. However, instead of being confined to the flat, as was the expectation of the fire safety design, the fire not only spread to other flats in the building but it also spread in an unpredictable manner. Internally, the fire spread from its floor of origin, both upwards and downwards, and appeared to jump floors as it did so. Externally, the fire travelled upwards on the outside of the building[95]. Aluminium window frames, installed as a result of previous building refurbishments, buckled because of the heat and allowed hot gases to transfer the fire upwards on the outside of the building. Escape balconies, designed to remain unenclosed, had also been enclosed as part of previous refurbishment work. These became obstructed and unusable because of the evolution of heat and smoke from fires in flats below them. The common corridors that linked to the common staircase, once heat and smoke had penetrated them, became a way for heat and smoke to move through the building. The common corridors had been penetrated by fire because of insufficient consideration to the fire protection that separated the flats from the corridors and staircases (Lakanal House, 2009; Kirkham, 2009; Kirton-Darling,

[95] Please see https://www.architectsjournal.co.uk/news/daily-news/lakanal-house-new-evidence-reveals-how-fatal-fire-spread/5204724.article (accessed on 15 Dec 2018) and Kirton-Darling (2018, p.187) for more information on how the fire spread throughout the residential building.

2018). The fire safety design, vital to the success of the stay-put policy, had been breached such that the life protection of the residents was demonstrably decreased[96].

Southwark Council was successfully prosecuted by London Fire Brigade because of the risks posed to the building's residents by the fire safety deficiencies prior to the fire occurring. Southwark Council pleaded guilty to four offences and was fined £270,000 with £300,000 costs[97]. Three of the four offences involved a failure to adequately sustain components of the fire safety design, essential to the maintenance of the safe environment originally envisaged by the building designers. The findings of the subsequent inquiry into the fire determined that the building had undergone a major refurbishment in 2006/7 that had given insufficient consideration to maintaining the black-boxed components of the fire safety design[98]. However, this also highlighted that considerable doubt existed whether, if the required fire risk assessment had been carried out, it would have correctly identified the fire safety failings that had been introduced and that had led to the fatalities. This is because the key to an adequate fire risk assessment is the competence of the fire risk assessor which, in this case, would have to have included an adequate understanding of the design of the building. In this particular building the design of the flats was difficult to understand for someone with no prior knowledge of this type of construction and of how the black-boxed fire safety components fitted together. The design principle was such that every flat should have two

[96] Please see https://lambeth.gov.uk/elections-and-council/lakanal-house-coroner-inquest for the verdicts and recommendations arising from the inquest into the deaths.

[97] Source: https://www.london-fire.gov.uk/news/2017-news/brigade-urges-lessons-to-be-learned-after-lakanal-fire-safety-prosecution/ (accessed on 15 Dec 2018).

[98] Please see https://www.localarchitectsdirect.co.uk/lakanal-house-a-case-study for a case study on the building, http://news.bbc.co.uk/1/hi/england/london/8133871.stm and https://www.bbc.co.uk/news/uk-england-london-21964325 for general details on the fire incident (webpages all accessed on 15 Dec 2018).

means of escape. To this end, access to the flats from the common corridors and staircase was on every odd numbered floor with an alternative means of escape onto a communal escape balcony on every even floor. The relevance of this knowledge is that a comprehensive fire risk assessment would have to have adequately assessed both the common means of escape and also the alternative means of escape. Thus a comprehensive knowledge of the layout of the flats and the common areas was a pre-requisite for the fire risk assessor. This highlights a common problem for duty holders which is that it is difficult to assess 'the competence of a particular person for a particular job ... because there's such a wide range of complexities of buildings'[99].

The above account of the incident and consequences of the fire safety failings gives some idea of the amount of competency needed to carry out a fire risk assessment on such a premises where aspects of the fire safety design are black-boxed and opaque to casual inspection. To be able to identify the deficiencies in the fire safety design that existed at the time of the fire incident required a comprehensive understanding of the original fire safety design and a knowledge of how the black-boxed components had been compromised.

Another indication of insufficient competence was a lack of awareness of a paradox involved when carrying out an extensive refurbishment of a building. To gain the knowledge necessary to carry out a competent fire risk assessment on a refurbished building would require invasive inspections of the completed work if the fire risk assessor had not been present at the time the refurbishment work was carried out or if there was any doubt about the efficacy of the refurbishment work. This is because adequate consideration of the salient features of the black-boxed fire safety design has to take place during the design and modification stage because, after the work has been completed and decorated

[99] Interview with a fire safety adviser: No.19: January 2015.

over, the only way for a fire risk assessor to check the efficacy of the work is by an expensive and inconvenient invasive inspection.

The question of invasive inspection in purpose-built residential blocks of flats has been addressed by the Local Government Association in *Fire Safety in Purpose-built Blocks of Flats* (LGA, 2012, pp.44-46). This document describes how for such premises there is a system of classification of fire risk assessment designated, Types 1 to 4. A Type 4 assessment, an invasive inspection of the common parts of a block of flats and within the flats themselves, is what probably would have been needed in order to gather sufficient evidence about materials and design to understand what led to the unusual fire behaviour in the fire incident at Lakanal House. But a Type 4 fire risk assessment would only have been recommended if it was thought necessary following a Type 1 fire risk assessment: 'the basic fire risk assessment required for the purpose of satisfying the [Regulatory Reform (Fire Safety) Order (2005)]' (LGA, 2012, p.45). A Type 4 fire risk assessment is recommended by a Type 1 fire risk assessment where doubt exists into whether the basic fire risk assessment has been sufficiently rigorous.

The Lakanal House case thus not only highlights the challenges presented by the black-boxing of fire safety features, but also the importance of knowledge and expertise in the implementation of post-construction fire safety regulation. However, the fundamental failing of Southwark Council of not even having carried out a fire risk assessment on Lakanal House points to an overwhelming flaw in a system based on self-regulation that also lacks adequate regulatory enforcement. Without adequate oversight, or sufficiently powerful sanctions, the potential exists whereby the self-regulator can administer the regulations to suit the objectives of the organisation rather than the occupants of particular buildings.

Shell Centre office complex: Enforcement following investigation into a fire incident

A case where serious regulatory breaches were discovered by firefighting crews attending a fire incident was the result of two fires occurring within a three week period at Shell Centre, York Road, London[100]. The regulatory breaches were as a result of a lack of consideration for the proper functioning of the fire safety design. The Shell Centre building is an office building and the headquarters of an international company which was being partly refurbished at the time of the fires. However, the regulatory breaches discovered by fire crews were thought to be so serious that fire safety enforcement officers imposed a Prohibition notice[101] on parts of the building until the faults they had identified had been rectified. Employees and members of the public were prohibited from entering the restricted parts of the building and only people working to remedy the fire safety deficiencies were allowed to enter these areas.

The fires were related to the refurbishment but caused only minor damage and there were no injuries to any person in the building as a result of either fire. Operational crews dealing with the fires had misgivings about what they observed and reported them, prompting an inspection by fire safety enforcement officers. The subsequent fire safety audit revealed that the operational crew were correct in their misgivings. Not only was there insufficient consideration for the fire safety design but the manner in which the work was being carried out was also life threatening to those carrying out the work.

[100] For further details on the Shell Centre incident, please see: https://www.thebigredguide.com/docs/opdf/news/shell-fined-record-sum-for-fire-safety-breaches.pdf (accessed on 15 Dec 2018) and Appleby and Small (2012, p.72).

[101] A Prohibition notice that takes immediate effect and prohibits or restricts access to a premises can be served by a fire and rescue authority if they consider that the threat to life from fire is so serious that immediate action must be taken. The notice can be used to prohibit the use of a premises, or a particular activity within the premises ((Regulatory Reform (Fire Safety) Order, 2005, s.31) and the (Fire (Scotland) Act, 2005, s.63)).

Shell International's fire risk assessment, which should have been the driver of the refurbishment planning because of the risks involved, was actually dated three and a half years earlier. Tellingly, some of the failings identified in the fire safety audit following the two fires had already been identified: 'The 2003 assessment had identified some of the same failings that were observed in the 2007 inspection' (Appleby and Small, 2012, p.72). That Shell had identified risks but not acted on this knowledge provides evidence that could be indicative of a number of things. It could indicate ignorance of what the regulations aspire to and the reasons behind carrying out and reviewing the fire risk assessment. It could indicate a lack of understanding of the functioning of the black-boxed fire safety components and the way they had been compromised, and also the implications and potential consequences to both the contractors and other occupants of the building. It could be seen as a case of normalisation of deviance whereby deviations from good practice were tolerated because there were no adverse consequences. Or it could indicate that the duty holder was deliberately administering the regulations to suit the demands of the business enterprise rather than the occupants of the building or contractors carrying out work.

Ordinarily, this type of building, an office building, would not attract the attention of the enforcement arm of the fire and rescue authority. 'We focus on what we consider the higher risk premises ... [inspections in] care homes will be every year, hospitals will be every year. Generally, it will be sleeping premises but we will do our mathematics, if we see there are more fires in shops ... we will go and audit those premises'[102]. In the case of this office building, it was the call for assistance by the contractors and then the observation of regulatory breaches made by the operational fire crews that prompted

[102]Interview with a fire safety enforcement officer: No.29: June 2015.

the fire safety audit. This could have been avoided by good management because ‘you can have a building with pretty poxy fire protection but if what goes on in the building is well managed and they don’t have a fire, then it doesn’t matter how safe the building is because we’ll never get to test it’[103]. The self-regulatory logic of UK post-construction fire safety thus does not rely on inspection for most premises, but this runs the risk that ‘poxy’ fire safety measures can remain unaddressed, with the potential to lead to loss of life.

Morven House care home: Enforcement following the receipt of intelligence from another agency

A similar case where the duty holder was negligent in carrying out their duties under the Regulatory Reform (Fire Safety) Order (2005) concerned the Morven House care home in Kenley, Croydon. Morven House was visited by fire safety enforcement officers in February 2013, following concerns raised by an officer of the Care Quality Commission (the regulator for health and social care in England) after carrying out a routine inspection. The fire and rescue authorities foster relationships with other agencies to encourage the flow of intelligence that may assist them in carrying out their functions. This type of relationship needs some preparation and prior agreement but takes advantage of a feature of care homes in the UK, that they are subject to more than one set of regulations. Other regulatory agencies are made aware of the type of fire safety regulatory breach that could increase the risk to occupants and are given directions as to the use of the intelligence. In this case, the concerns expressed were found to be justified when a fire safety audit was carried out and provided sufficient evidence to prosecute the duty holder.

[103] Interview with a former fire safety enforcement officer: No.7: November 2014.

Morven House care home was undergoing building work but there had been little consideration for the fire safety design in the way that the building project was being conducted. The Care Quality Commission inspector had noticed that escape routes had been obstructed by scaffolding, and there were doors, previously available, that had been bricked up. However, without an assessment of the fire risk by a sufficiently competent fire risk assessor, a bricked-up door (assuming the door was previously a fire exit door) might not represent a significant deterioration of the fire safety design. A sufficiently competent fire risk assessor would question the reason for a bricked-up door and investigate what documentation existed to explain it[104].

Following their fire safety audit, the enforcement officers argued that little or no thought had been given to the alternative arrangements for evacuating the seventeen residents present at the time of their visit. The reason for this, they alleged, was because no consideration had been given to the impact on the fire safety design and how it would be affected during the duration of the building work. Evidence for this was that there was no fire risk assessment that took account of the potential impact of the building work. If the care home is to be continuously occupied whilst a major building project is carried out, a significant amount of thought has to be given to how the project will be carried out. With regard to the fire risk assessment, perhaps the initial item that has to be contemplated is if continuous safe occupation of the care home is actually possible during that period. If this is considered possible then the fire risk assessment would need close and regular review because of the inevitable environmental changes affecting the risk to the occupants. Such a process would demand several evolutions of the fire risk assessment and an almost constant monitoring and supervision of the building work by the care home

[104] Interview with a local authority building control officer: No.30: June 2015.

management system.

With regard to such reviews, the fire safety regulations state that a fire risk assessment 'must be reviewed regularly so as to keep it up to date particularly if ... there is reason to suspect that it is no longer valid' (Regulatory Reform (Fire Safety) Order, 2005, s.9(3)(a)). In the case of Morven House, the court accepted the evidence of the fire safety enforcement officers that the review was necessitated because building alterations constituted a significant alteration. The fire risk assessment was no longer considered valid because of the bricked up doors and the blockages on the escape routes. Carrying out a fire risk assessment under these circumstances is dependent on both negotiation with the contractors and monitoring of their work. It also calls for an expertise of how contractors and building contracts work and the case calls into question that sufficient expertise of the existence and operation of the fire safety design was present. It seems likely that there was a lack of the awareness of what the regulations aspire to and the reasons behind carrying out and reviewing the fire risk assessment.

The case represents another instance when the self-regulating approach of the fire safety legislation is shown not to be working well. As a result of their breach of the regulations, Morven Healthcare Limited, the company that ran Morven House care home, was fined £45,000 plus costs of £23,488 in May 2014[105].

Rosepark care home: Enforcement following fire fatalities

The expertise that has been used in the fire safety design of a building has to be complemented by the expertise necessary to maintain the fire safety design during the building's occupation. Management of fire safety in a building

[105] Source: https://www.london-fire.gov.uk/news/2014-news/croydon-care-home-slapped-with-70-000-fines/ (accessed on 15 Dec 2018).

includes harnessing the necessary expertise to assimilate and understand the black-boxed components of the fire safety design in order to maintain the safe environment envisaged by the building designer. Neglect in this endeavour can lead to a degradation of that safe environment and non-compliance of the post-construction fire safety regulations. In the following case, not only was the concept of the fire safety design not given the attention that it deserved by the management of the occupied building but the fire safety design was also left incomplete before the building was occupied.

The Fatal Accident Inquiry (FAI)[106] that took place following the fire at a care home in Scotland, highlighted a number of serious breaches in fire safety regulation. The fire occurred at Rosepark care home in Uddingston, near Glasgow on 31 January 2004 and resulted in the deaths of fourteen elderly residents who died from inhalation of smoke and fumes. This number of deaths represented about one third of the residents.

The fire began in a cupboard in a corridor and the ignition of combustibles in the cupboard was determined to have been the result of a poor electrical connection. The fire was severe, short-lived, and confined to the cupboard but the heat and smoke that evolved from the fire filled the corridor, the bedrooms off the corridor, and the adjacent corridors. This revealed one of the main flaws in the care home's fire precautions and the most likely reason for the deaths of the residents, the breaches in its compartmentation. Compartmentation is the fire protective strategy based on the concept of 'a building subdivided into a set of nested enclosures so that if a fire occurs in one enclosure (in a Care Home most likely in one of the residents' rooms), then the fire and smoke are contained in that enclosure. Also, if smoke or fire escape from the fire

[106] A Fatal Accident Inquiry (FAI) is held in respect of fatalities occurring in Scotland in circumstances that could give rise to public concern; circumstances such as a fatal accident, a death in custody, or a death that is sudden, suspicious, or unexplained (Inquiries into Fatal Accidents and Sudden Deaths etc. (Scotland) Act, 2016).

enclosure, they are contained within a subcompartment consisting of a short length of corridor limited by cross-corridor fire doors, with the adjoining rooms further protected by their individual compartmentation' (Purser, 2014, p.431). In Rosepark, the specific breaches of compartmentation were that bedroom doors were wedged open allowing the ingress of smoke and heat, and ducting fire dampers had not been installed, allowing heat and smoke to escape the enclosure[107].

The fire occurred prior to the introduction of the current post-construction fire safety regulations, the Fire (Scotland) Act (2005). Thus, fire safety in the care home was enforced under the Fire Precautions (Workplace) Regulations (1997) (as amended by the Fire Precautions (Workplace) (Amendment) Regulations (1999)), legislation that was rescinded when the current post-construction regulations were introduced. However, the Fire Precautions (Workplace) Regulations (1997), operated in the same manner as the current post-construction regulations in that they required the duty holder (the employer) to carry out a fire risk assessment to determine the correct fire safety measures (Fire Precautions (Workplace) Regulations (1997, Part 2, s.3); Management of Health and Safety at Work Regulations (1992, s.3)).

One of the charges brought against the owners of the two storey care home was that their fire risk assessment was not adequate. An adequate fire risk assessment was a requirement of the post-construction fire safety regulations. A major factor leading to the inadequacy may have been because the fire risk assessor who had carried out the fire risk assessment had no specialist expertise in assessing fire risk. The fire risk assessor presented himself as a health and safety and employment expert rather than as a fire risk assessor.

[107]For general background information on the Rosepark incident, please see the presentation given by David Mallin, Lothian and Borders Fire and Rescue Service, available at https://jacksonfire.co.uk/wp-content/uploads/2017/02/Rosepark-IOSH-Dec-2012.pdf (accessed on 15 Dec 2018).

As the FAI report concluded: ‘It is correct to state that [the fire risk assessor’s] template risk assessments were not specific to care homes, that they were out of date, and that he did not have the experience or competence or qualifications to hold himself as an expert in fire risk assessment’ (Lockhart, 2011, Note to Chapter 24, p.353).

The cause of the tragic outcome of the Rosepark fire was a succession of fire safety failings that could have been identified by a competent fire risk assessor and subsequently rectified in a suitable management action plan. In the case of Rosepark the inadequate fire risk assessment meant that a variety of problems were not identified and remedied. For example, a key component of the fire safety design, the fire dampers, were not fitted: ‘Had a fire damper been installed where the ventilation ducting passed above the corridor 3/4 fire door, it is unlikely that the quantities of smoke, which would then have passed into corridor 3 through the ducting prior to the operation of the damper, would, on its own, have been life threatening’ (Lockhart, 2011, RP3.6(iv), p.31). Also, an electrical cable connected to the electrical distribution board in the cupboard was not installed according to the electrical regulations: ‘The live conductor of cable V [the offending cable] came into contact with the metal edge of the knockout such as to generate an arc ... The arc generated sparks which escaped from the distribution board. Those sparks either ignited solid flammable materials stored within the cupboard, thereby starting the fire, or a flammable cloud within the cupboard which in turn ignited solid flammable materials within the cupboard’ (Lockhart, 2011, s.6(1)(b), p.24). Furthermore, an amendment to the fire alarm system meant that ‘alarm zones overlapped compartments’ making the alarm zone descriptions ‘ambiguous and confusing’ (Lockhart, 2011, RP7(5) and (6), p.41).This coupled with a lack of ‘effective staff training in fire procedures’ (Lockhart, 2011, RP7(10), p.41) caused the loss of valuable minutes when the fire alarm system first detected the fire.

Rectifying the failings would have led to a safer environment, one in which the fire may have been prevented from doing harm. A satisfactory fire risk assessment would have identified some key elements of fire precautions that were complicit in reducing the effectiveness of the fire precautions. The absence of the necessary expertise because the fire risk assessor 'held no specialist qualification in fire risk assessment' (Lockhart, 2011, Chapter 24, p.336) had a direct bearing on creating this situation. The lack of expertise meant that he may not have understood the different circumstances that could have led to the ignition that actually occurred. The fire risk assessor may not have known that part of the intention of the regulations concerned with electrical installations was to reduce the likelihood of an ignition occurring. Further, he may not have comprehended that the hidden breaches in the fire compartmentation, a key component of the black-boxed fire safety design, could have had the devastating effect that they did have. He may not have realised that the consequences of his lack of expertise could have contributed to the situation that was produced.

The expertise of the fire safety enforcement officer was also disregarded by the owners/management of the care home. The fire safety enforcement officer recommended that all of the bedroom doors opening into corridors should be fitted with self-closing devices because it was known that bedroom doors, open at night whilst residents were asleep, increased the risk of harm if a fire occurred. However, this control measure is disliked by both management and residents of care homes (in general) and is often not effected because of the isolation experienced by the residents resulting from the measure. In Rosepark, door closers were fitted but later removed because the owners/management were aware that the preference of residents and the policy in a second care home also operated by the owners of Rosepark was that that certain residents preferred their bedroom doors to be left open because ‘some residents became distressed if their bedroom doors were closed at night’ (Lockhart, 2011, Chapter 15, s.34, p.259). Thus the door closers at Rosepark were removed so long as the staff took responsibility for closing the doors at night. However, the natural function of normalisation of deviancy dictated that leaving the doors open rather than closing them became normal practice over time and this was the case at the time the fire occurred. It was only then that it became apparent that leaving bedroom doors open was a breach of the safe environment provided in the black-boxed fire safety design of the building.

Although the Rosepark fire happened under an earlier regulatory regime than the current one, the operation of the regime was very similar and the incident highlights issues that remain relevant, especially with regard to the crucial role of expertise in implementation of fire safety guidance. Since Rosepark the Government has made available guidance documents for a range of types of premises (including one for ‘residential care premises’[108]), and various organisations now provide accreditation for fire risk assessors, although it remains the case that fire risk assessors can continue to operate with varying levels of experience and competence. It is entirely up to the duty holder as to what qualifications they require of the person chosen to carry out a fire risk assessment on their premises.

This raises concerns about the self-regulating approach of the current fire safety regulations. Not only does it allow a duty holder to administer the regulations without the competence to do so but, perhaps motivated by the potential to save money, can allow a slow degradation of the components of

[108] The Government guidance document for residential care premises is available at https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/14885/fsra-residential-care.pdf (accessed on 15 Dec 2018).

the black-boxed fire safety design to be normalised over a period of time.

New Look retail store: Enforcement following an investigation into a fire incident

The enactment of the current post-construction fire safety regulations was part of the Government's attempt to reform 'legislation which has the effect of imposing burdens affecting anyone in the carrying on of any activity' (Regulatory Reform Act, 2001, s.1). Removing the perceived burdens of fire safety in premises throughout the UK has led to the current regulatory regime that relies on the self-regulation of post-construction fire safety. However, it was the difficulties experienced by duty holders struggling with self-regulation that contributed to the fire incident at New Look in Oxford Street London in April 2007. The fire incident involved a well-known retail store in a prominent location and resulted in the discovery of serious fire safety breaches that emerged during the investigation to establish the cause of the fire. The subsequent fire safety audit demonstrated that although a fire risk assessment had been completed and had identified certain deficiencies in the fire safety regime, its findings had not been acted upon (New Look Retailers Limited v London Fire and Emergency Planning Authority, 2010).

Because the 2005 regulations (enacted in October 2006) had the effect of taking the day-to-day regulatory activities from the regulator (the fire and rescue authorities) and giving them to the duty holder for each regulated premises, regulatory oversight was effectively devolved to the regulated industry. This can be seen as a form of regulatory capture where the regulated industry has full control over how they regulate themselves even though they are overseen by the regulator who has duties for overall enforcement.

The regulations require that a fire risk assessment of the premises be carried out by the duty holder to identify the fire hazards and the persons at risk from those hazards. However, if the premises was the subject of a fire certificate under the superseded legislation, as was the case with the New Look store in Oxford Street, London, the expert advice was that although the fire certificate was now rescinded, as long as there had been no material alterations to the premises and all the physical fire precautions have been properly maintained, then it was unlikely that there would be any significant alterations needed to achieve compliance (DCLG, 2006).

In this case, the duty had been undertaken and the fire risk assessment had been completed but it had been completed by an employee with no specific qualification in the assessment of fire risk. Government guidance on fire risk assessment advises that individuals with little qualification can use the guidance to carry out fire risk assessment on simple buildings, whereas more qualified individuals should be asked to carry out fire risk assessment on complex buildings. However, the guidance gives little definition of the terms, simple or complex.

Notwithstanding the guidance, one fire safety engineer's expectation is that a 'fire risk assessor should be able to recognise the age of building, the type of building, and to expect a manual of information' to assist in determining whether or not the building is simple or complex[109]. What guidance there is makes the distinction between simple and complex, so it is necessary to distinguish between the two to progress the regulations. A fire safety consultant has pondered on the question and thinks we need a better understanding of what constitutes the two types: 'Is a complex building, a building that is fire-engineered or can a complex building be a code-compliant build-

[109] Interview with a fire safety engineer: No.21: January 2015.

ing[110]? Well, actually, code-complaint buildings can be really complicated, you know, theatres, hospitals, shopping malls, could be co-compliant and of course, HTMs[111] or 9999[112] doesn't mean it's not complicated. It is complicated'[113].

In the case of the New Look store, one characteristic that might define the premises as complex, rather than simple, is that there were at least two separate companies who occupied the building. New Look occupied the basement, ground, first and second floors, and a company called Fresh and Wild occupied the third and fourth floors. In such a premises, unless there is adequate fire separation between two occupancies/companies, thus making them distinctly separate, they have to be considered as one occupancy/company. This is an important differentiation in fire safety because fire separation, a black-boxed component of the fire safety design that is not always obvious to casual inspection, is not only difficult to achieve but it is also difficult to maintain once achieved[114]. Achievement of fire separation means that a fire in one occupancy/company will not affect the other occupancy/company. However, non-achievement means that a fire in one occupancy/company may quickly affect the other occupancy/company. Thus, non-achievement puts the occupants of both occupancies/companies equally at risk. As a consequence, the regulations require cooperation between the duty holder of each occupancy/company and coordination of their fire precautions (Regulatory Reform (Fire Safety) Order (2005, s.22) and Fire (Scotland) Act (2005, s.21)).

[110] A code-compliant building is one that is designed to a prescriptive building code.

[111] Health Technical Memoranda (HTMs) give comprehensive advice and guidance on the design, installation, and operation of specialised building and engineering technology used in the delivery of healthcare in the UK.

[112] *British Standard 9999: Fire Safety in the Design, Management and use of Buildings*, can be applied to existing buildings, alterations, and extensions, as well as to the design of new buildings in the UK.

[113] Interview with a fire safety consultant: No.12: January 2015.

[114] For more details on *fire separation*, please see (Approved Document B, 2010).

As far as the fire risk assessment in a building with more than one occupancy/company is concerned, there is no easy way to carry it out. Initially, in such a building, the fire separation has to be confirmed and this requires a quite detailed knowledge of building structure and building regulations. If the fire separation cannot be confirmed, then its non-existence has to be assumed and detailed negotiations have to be commenced between the occupiers. The negotiations include, amongst other things, how the fire risk assessment is to be carried out. The assessment has to cover the whole of the premises, including all of the occupancies that are not fire-separated, assessing each occupancy for fire hazards and persons at risk. Finally, the risk control measures must account for all of the fire hazards and persons at risk in each occupancy, and be maintained by agreement between the respective duty holders.

The fire risk assessment was completed in respect of New Look but with two large anomalies. Firstly, although the fire risk assessment correctly identified some of the fire safety deficiencies present in the premises, it did not identify the steps to be taken to correct them. As a result, the necessary steps had not been incorporated into the management system and there was no inclination to carry them out. One of the deficiencies, made obvious by the behaviour of staff and customers present in the store when the fire occurred, was a lack of staff fire safety training. Fire safety staff training is a critical component (part of the *script*) of operation of the black-boxed fire safety design and its inadequacy was shown to effect when the fire occurred. When people realised that they were in danger and decided to make their way out of the premises, they did not receive appropriate guidance from the staff because the staff were not trained how to supervise customers under those conditions. Thus, instead of using the designated fire escape routes, when they made their escape, the customers went to the front entrance of the store, the entrance they were familiar with. But, in taking the action that they did, the customers travelled underneath the fire on the upper floors and put themselves in danger of falling debris. A satisfactorily trained staff would have directed customers to the alternative fire exits away from the danger present at the front entrance (New Look Retailers Limited v London Fire and Emergency Planning Authority, 2010; Appleby and Small, 2012).

Secondly, one of the two rear escape routes from the basement had, at some time between the issue of the fire certificate in 2000 and the occurrence of the fire in 2007, been discontinued as a fire exit. The fact that the escape route was, at one time, considered to be necessary as a means of escape from the basement was clear because it was marked on the rescinded fire certificate. Discontinuing this escape route would have been acceptable had a suitable and sufficient fire risk assessment weighed up the pros and cons of its discontinuation and deemed it appropriate. However, there was no plausible explanation either recorded or put forward as to why the use of the fire exit had been discontinued. The lack of a suitable record is also indicative of a lack of expertise because: (1) there needs to be an explanation of why a significant component of the black-boxed fire safety design, a previously necessary fire exit, has been taken out of use so that future fire safety decisions can be more informed; (2) the detail of whether it affects the components of the fire safety design in the other occupancies in the building also needs to be explained and recorded. The record should include the results of any consultation between the duty holders of the different occupancies (New Look Retailers Limited v London Fire and Emergency Planning Authority, 2010).

In court, the prosecution claimed that New Look were responsible for some thirty-five alleged breaches of their duty, but only brought two charges: (1) a failure to carry out a suitable and sufficient fire risk assessment, and; (2) a failure to make sure that staff were adequately trained. New Look were found guilty and fined but then appealed against the fine because there had been no loss of life or injuries from the incident. The Appeal judges determined that it was sufficient that New Look had been found guilty of placing people seriously at risk of harm. Their judgement confirmed the tenet that even though no harm results from a fire incident, the key principle used against a duty holder in the regulation of fire safety is the extent to which risks have been ignored or have not been identified and corrected. A court can be satisfied of the seriousness of the risk posed to people and the potential harm that may ensue without having to wait for them to occur (Appleby and Small, 2012).

This case exemplifies a key concern with deregulation of post-construction fire safety that places the onus on the duty holder and thus amounts to regulatory capture. The problem is not simply that businesses may prioritise day-to-day commercial pressures over the potential (but rarely realised) threat of fire. The problem is also that duty holders may have little understanding of the risks presented by their premises and of the actions expected of them (despite it being their legal obligation to do so). In the New Look case, the failure of the duty holder to incorporate the recommendations of the fire risk assessment into the management system could have been a result of inexperience on the part of the fire risk assessor. Similarly, the proposal to discontinue the basement fire exit needed to have gone through an exhaustive process of consideration of the consequences before it was discontinued. This may have happened but a competent management system would have seen the need for the decision-making process to be recorded because the information is important for future considerations. The ultimate blame can be laid on regulatory capture because it was lack of external oversight that allowed the situation to continue. The specific problem in this case was the lack of expertise held by the fire risk assessor and duty holder, which meant that they had insufficient competence to understand and remedy fire safety failings.

Penhallow hotel: Enforcement following fire fatalities

Another fire incident that demonstrated the difficulty faced by duty holders struggling with the self-regulation of post-construction fire safety involved a hotel. Hotels and boarding houses are normally premises where people may enter and secure a room for the night assuming that their safety, in the event of a fire occurring, has been properly considered. Guests have no knowledge of the idiosyncrasies of the premises nor, probably, in the assessment and control of fire risk but rely on the competency of the management in that respect. Competence in the operation of the management system is essential in any premises where fire safety regulations are self-regulated but even more so in premises where there is sleeping accommodation.

The fire at the Penhallow hotel, a sea-front hotel in Newquay, Cornwall, occurred on 18 August 2007 and resulted in the deaths of three people resident on the upper floors at the time of the fire. They were unable to make their escape due to failings in the fire protection that was supposed to assure their safety. The incident demonstrates how faults made while complying with the regulatory system under previous legislation can have an impact on subsequent legislation.

The fire safety precautions in the Penhallow hotel were formerly controlled by a fire certificate issued under the Fire Precautions Act (1971). Fire certificates were used to control fire precautions in designated hotels and boarding houses until the legislation requiring them was repealed in 2006. At the time of the fire, in August 2007, the Penhallow hotel came under the auspices of the subsequent (and current) regulations, the Regulatory Reform (Fire Safety)

Order (2005), enacted 10 months earlier. This meant that, in terms of fire safety regulation, the Penhallow hotel Fire Certificate no longer applied but as long as there had been no material alterations to the premises and all the physical fire precautions had been properly maintained, then it was unlikely that there would be any significant alterations needed to achieve compliance with the subsequent (that is, the current) regulations (DCLG, 2006).

The hotel had been purpose-built sometime between 1912 and 1917 and had traded as a hotel since that time. In 1972, on the enactment of the Fire Precautions (Hotels and Boarding Houses) Order (1972), the hotel was identified as a designated use, meeting the criteria set by the legislation and so was required to be a certificated premises[115]. A fire certificate was duly issued in 1976 after fire safety work had been carried out to the satisfaction of the fire authority. Part of the work involved the construction of a fire staircase to improve the means of escape from the upper floors of the hotel. In 1992, the hotel owners submitted plans to the local authority building control to alter the first floor of the premises and convert the manager's flat into bedrooms with internal bathrooms. A requirement was identified during the process of plan approval under building regulations for an alternative means of escape from the first floor. The proposal covered the provision of a fire exit from the rear of the first floor that linked up to the existing fire staircase providing means of escape from the upper floors. The plan was approved, the work was completed, and the fire certificate was amended to include the new layout[116].

[115]A requirement for a fire certificate existed if a hotel or boarding house had sleeping accommodation for staff, and dining and sleeping accommodation for guests. However, a premises was exempt unless there was sleeping accommodation for more than six persons (either staff or guests) and some of the sleeping accommodation was above the first floor level or below the ground floor level (Fire Precautions (Hotels and Boarding Houses) Order, 1972).

[116]For more information on the Penhallow fire incident please see https://www.ifsecglobal.com/uncategorized/the-penhallow-hotel-fire-accident-arson-or-incompetence/ (accessed on 15 Dec 2018).

Fire certificates were a mixed blessing and were part of a system of regulation that required the regulator to provide the expertise on fire risk assessment leaving the occupier to provide the expertise on fire safety management[117]. This suited many occupiers of premises and it appeared that 'a lot of them liked the fact that we came in and told them what they had to do and they just, a lot of them, just went out and did it. Whatever we told them they went and did'[118]. A fire safety manager commented that a fire certificate 'showed you the position of the fire doors and it was brilliant! It was a good document and I think it was a big loss to society and to the health and safety world when that stopped being a requirement . . . I haven't got that information now and I often wonder is that a fire door or is it not?'[119].

During the investigation into the Penhallow Hotel fire and the inquest into the three fatalities, it was concluded that there was insufficient fire protection to the rear fire staircase, leading to the inability to use it because of heat and smoke from the fire (Cox, 2012). This could have been identified on the introduction of the Regulatory Reform (Fire Safety) Order (2005), which provided an opportunity for a totally new evaluation of the fire precautions undertaken by a fire risk assessor unconnected to the fire authority. However, in light of the guidance that came with the new regulations was that as long as there had been no material alterations to the premises and fire precautions then it was unlikely that there would be any significant alterations needed to achieve compliance, it is not surprising that in the case of Penhallow hotel,

[117]Not all premises were required to be certificated under the Fire Precautions Act (1971), only those premises that were designated were required to have fire certificates. For example, there was no legislation in place that required premises such as schools, hospitals, nightclubs, and so on, to have fire certificates because they were not designated premises. In contrast, under the current fire safety regulations (the Regulatory Reform (Fire Safety) Order (2005) and the Fire (Scotland) Act (2005)) such premises are automatically included in the need to self-regulate fire safety.

[118]Interview with a former fire safety enforcement officer: No.7: November 2014.

[119]Interview with a fire safety manager: No.9: December 2014.

the fire certificate would be used as the basis of the fire risk assessment. Nevertheless, an adequate fire risk assessment should have highlighted the inadequacy of the fire protection to the staircase.

The inquest into the deaths reached an open verdict following contradictory statements from the principal witnesses and conflicting evidence as to whether the fire may have been started deliberately. The company that owned the hotel was brought to trial and found guilty of failing to make sure the fire alarm system was working correctly, and of failing to carry out a suitable and sufficient fire risk assessment. A fine of £80,000 was imposed and one consequence of the incident was the decision of the fire and rescue authority to replace part-time fire cover in Newquay with full-time fire cover[120].

This case does not reflect well on the enforcement practices of the fire authority given that the premises had been inspected several times, but it also highlights a lack of expertise on both the fire authority and on the duty holder. This is unusual because the expertise on the part of the fire authority in producing a fire certificate is usually taken to be reliable. It is taken to be reliable to the extent that the lack of expertise on the part of the duty holder can usually be compared to that of the fire authority and presented as an expertise asymmetry. However, in this case, the lack of expertise in the production of the rescinded fire certificate is apparent because of the inadequate maintenance of a safe environment due to an apparently incorrect application of the regulation. The incorrect fire certificate then being accepted without question on the change to self-regulation. The hotel manager 'was poorly equipped and trained to carry out this role and never fully realised the failings in the hotel's

[120]Source: BBC News at http://www.bbc.co.uk/news/uk-england-cornwall-13277198 and the Express at http://www.express.co.uk/news/uk/244653/Fatal-fire-hotel-owners-sentenced (accessed on 15 Dec 2018)

fire safety arrangements'[121]. The hotel manager's role included that of self-regulating the fire safety regulations, however, a poorly equipped and trained self-regulator with a lack of understanding about the black-boxed components in the fire safety design is unlikely to apply the regulations successfully.

Donwell House care home: Enforcement following an investigation into a fire incident

The regulatory breaches found by fire safety enforcement officers at Donwell House care home in Washington, Tyne and Wear following a fire in September 2014, were held to be the cause of an elderly resident becoming trapped in her room. They were also a further demonstration of the difficulties surrounding the self-regulation of post-construction fire safety regulations. The fire had occurred in a first floor bedroom of the sixty-three bedroomed care home but, because the bedroom door to the corridor was open, the smoke and heat of the fire had entered the corridor. The corridor quickly filled up with heat and smoke effectively trapping an elderly resident who was later rescued safely by firefighters who made entry through her bedroom window.

Fire safety enforcement officers, alerted by firefighting crews, carried out a fire safety audit following the fire. They noted regulatory breaches such as fire-resisting self-closing doors wedged open to prevent them closing and the presence of fire extinguishers, half of which had been condemned by the contracting company but not removed by the care home management.

When the evidence was presented in court, the court was satisfied that the care home management was in possession of an adequate fire risk assessment. However, the list of recommendations that would have resulted in appropriate risk control measures of the fire hazards and people at risk had not

[121] Source: https://www.ifsecglobal.com/uncategorized/the-penhallow-hotel-fire-accident-arson-or-incompetence/ (accessed on 15 Dec 2018).

been included in the management plan. The particular recommendation that would have controlled the circumstances that led to the resident being trapped in her room by heat and smoke had been envisioned and resolved by the fire risk assessor. This was the provision of hold-open devices on fire-resisting self-closing doors that acted to release the door electronically whenever the fire alarm was activated. However, this recommendation along with the other recommendations had been ignored by the care home management.

The evidence gathered by fire safety enforcement officers was accepted by the court and the company running the care home was found guilty of five breaches of the fire safety regulations. This resulted in a fine of £380,000 plus costs of £29,222[122].

A later inspection of the care home by the Care Quality Commission (CQC) in October 2016 resulted in the care home being rated as *Inadequate* and placed in special measures. A rating of Inadequate is the lowest of four ratings given by the CQC, the first being *Outstanding*, then *Good*, then *Requires improvement*, and finally *Inadequate*. The application of special measures means that a care home is undergoing a process designed to provide a timely and coordinated response when the standard of care has been judged as inadequate. The standard of fire safety was part of the process because the inspection report states, 'Fire safety was a real concern for us, including inadequate fire detection systems and a very out of date evacuation register. We had previously told Donwell House that they must take action to fix these problems at a previous inspection so it was disappointing to see that none had

[122]For more details please see: https://www.sunderlandecho.com/news/operator-of-fire-hit-care-home-fined-400-000-for-putting-residents-lives-at-risk-1-7814703 or https://www.chroniclelive.co.uk/news/north-east-news/washington-care-home-fire-results-11092529 or ttps://www.sunderlandecho.com/news/operator-of-fire-hit-care-home-fined-400-000-for-putting-residents-lives-at-risk-1-7814703 (all webpages accessed on 15 December 2018).

been taken'[123]. That the CQC report states this reflects on the willingness of the CQC to have due regard for other regulations and it also gives a record that could assist the fire authority to work positively with the management of the care home to improve fire safety.

This case again shows the limitations of self-regulation of post-construction fire safety in a care home populated with some of the most vulnerable people in society in respect of their risk from fire. As the self-regulator, the duty holder has all the responsibilities set out in the regulations. To administer them correctly requires a certain amount of expertise which looks to have been missing in this particular care home except for the existence of an adequate fire risk assessment. A safe environment can only be maintained with a well-regulated, dynamic, responsive management system that is capable of turning the considered recommendations given by a competent fire risk assessor into achievable management actions: as one fire risk assessor commented, 'a fire risk assessment is a tool to tell someone how to manage a building properly. It's not an end in itself'[124].

One recommendation emanating from the fire risk assessment concerned the fire-resisting bedroom doors being fitted with devices that hold the door open until a signal from the fire alarm system releases the magnetic catch that holds them open. These were not provided and the fire safety audit records the doors as being held open with wedges to prevent them closing. The risk that this posed was either forgotten or not appreciated by the management of the care home who sanctioned the use of wedges, thus allowing the practice to become normalised over time. It indicates the lack of understanding of

[123] Source: Debbie Westhead, Deputy Chief Inspector of Adult Social Care in the North: http://www.cqc.org.uk/news/releases/care-quality-commission-takes-action-protect-people-donwell-house-washington (accessed on 15 Dec 2018)

[124] Interview with a fire risk assessor: No.15: January 2015.

components in the black-boxed fire safety design and the need for sufficient expertise and knowledge to operate a competent fire safety management system. Similarly the condemned fire extinguishers being left in position also indicate the same lack of knowledge and expertise in managing the risk that this posed.

Whether or not the fire safety regulations are working in a premises such as a care home are down to the duty holder who is the self-regulator nominated by the regulations. If the duty holder has sufficient qualifications, expertise, and training, she is likely to be sufficiently competent to carry out the regulatory requirements correctly. However, without the motivation to carry out the self-regulation to a satisfactory degree, being sufficiently competent may not be all that is necessary to make the occupation of care homes by vulnerable people an acceptable risk.

Bowland Lodge care home: Enforcement following an investigation into a fire fatality

The fire at Bowland Lodge care home, Western Avenue, Newcastle in August 2009, revealed another case where self-regulation of fire safety proved to be inadequate. Tragically, the fire involved an elderly resident setting fire to himself but whilst they were dealing with the incident, firefighting crews observed breaches of the regulations elsewhere in the care home. Considering the breaches to be serious, the firefighting crew reported them to fire safety enforcement officers who promptly visited the care home and carried out a fire safety audit. The audit showed that the firefighting crew's observations had been correct as there were a number of breaches picked up by the fire safety enforcement officers.

As a result of the findings of the fire safety audit, the Tyne and Wear Fire and Rescue Authority (TWFRA), the enforcing authority, concluded that the regulatory breaches placed the residents, staff and visitors in serious danger of death or injury should a fire occur. Consequently, TWFRA prosecuted both the company who owned the care home, and also the manager of the care home. The prosecution case put forward by the enforcing fire and rescue authority was made up of a number of failings in the maintenance of components of the fire safety design that were identified by the audit: (1) a fire exit not only padlocked but also nailed shut; (2) unsafe external escape routes obstructed by work to modify the structure of the building; (3) a lack of maintenance and fire-stopping[125] of holes through floors, ceilings, and walls negating the compartmentation designed to confine the heat and smoke from a fire; (4) the lack of a suitable and sufficient fire risk assessment that identified the risks posed to the care home residents and staff[126].

The court concluded that the correct standard of fire risk assessment plus the requirement for the assessment to be reviewed when a material change takes place, should have been sufficient to maintain a safe environment. A properly functioning management would have identified that building work to the structure had an impact on the fire escape route and determined that it prompted a review of the fire risk assessment. The review would have identified that the obstruction was a hazard and could have recommended action to mitigate the temporary risk. Items such as the breaches in compartmentation would have resulted in recommendations to identify and rectify them within a reasonable time period. An action plan could have been included in the care

[125] A fire-stop is the 'seal provided to close an imperfection of fit or design tolerance between elements or components, to restrict the passage of fire and smoke' (Approved Document B, 2010, Appendix E, p.142).

[126] For more information, please see: https://www.fire-magazine.com/care-home-owners-admit-fire-safety-breaches and https://www.cqc.org.uk/sites/default/files/historic_reports/1-101631740_Mr_Ram_Perkesh_Malhotra_%26_Mr_Darshen_Kumar_Malhotra_1-109533668_Bowland_Lodge_0000000434_20082009.pdf (both webpages accessed 15 Dec 2018).

home management plan and, subject to the principle of proportionality, could have been carried out in a satisfactory manner. Both the manager (as the duty holder) and the care home company were found guilty of breaches of the fire safety regulations. The manager of the care home was fined a total of £2400 in relation to the blocked fire exit, and the company was fined a total of £18,750 plus the court costs[127].

The over-riding factor in this case was the lack of expertise in the understanding and awareness of the proper functioning of the fire safety design. The components of the fire safety design were black-boxed as far as the duty holder was concerned along and of the management system was not adequate to ensure that the regulatory responsibilities were carried out to maintain them. There was a fire risk assessment in existence but the management failed to realise that a change in the circumstances can easily undermine all or part of the assessment. The only solution to this problem, which is prevalent in any premises, and not just a care home, is to review the assessment and its control measures in the light of the changed circumstances. Because of the risk posed in a care home full of vulnerable people this may require considerable understanding and expertise. However, there are two sorts of understanding and expertise that are necessary in the fire risk assessor; 1) the characteristics and dynamics of fire in buildings similar to a care home; and 2) the management system of the specific care home, its daily routines, and the types of vulnerability in the residents. There are many individuals that have understanding and expertise in one of these two sorts but there are likely to be very few who have understanding and expertise in both.

[127] Source: https://www.fire-magazine.com/care-home-owners-admit-fire-safety-breaches (accessed on 15 Dec 2018).

Anonymous hotel: Enforcement that is contentious and disputed

Regulatory enforcement is important in situations where the post-construction fire safety regulations have not been complied with to the satisfaction of the enforcing authority. The regulations prescribe the course of action available to remedy the non-compliance but there are occasions where the enforcing authority and the duty holder are in disagreement with the proposed remedy. At this juncture the regulations provide for the matter to be referred to either the Secretary of State (England and Wales) or the Scottish Ministers (Scotland) for a conclusive determination (Regulatory Reform (Fire Safety) Order (2005, s.36) and Fire (Scotland) Act (2005, s.67)).

Such a disagreement about a proposed remedy was referred for evaluation and adjudication to the Secretary of State in 2012 (DCLG, 2012). It revolved around the proper consideration of the black-boxed fire safety design in respect of the standard of fire-resisting doors fitted in a hotel. The evaluation and adjudication was in respect of a duty holder challenging the view of a fire and rescue authority on the matter of the required standard of a component of the fire safety design in a hotel. There was no disagreement about the requirement to maintain the fire safety design, what was in dispute was the standard required of one of the components of the fire safety design. The fire and rescue authority claimed that the fire risk assessment was deficient because it had not recommended the correct standard in respect of the fire-resisting doors to some of the hotel bedrooms. The fire-resisting doors, accepted as satisfactory under a previous regulatory regime had, in the determination of the fire and rescue authority, become unacceptable because better and more effective solutions were now available through technological innovation. The duty holder disagreed and the matter was referred to the Secretary of State for a determination.

The fire and rescue authority objected to the fire-resisting doors being accepted as satisfactory by a fire risk assessor acting on behalf of the duty holder. The alternative remedy they proposed was that all the hotel bedroom doors should be fitted with technology that would provide sufficient fire protection to meet current fire protection standards. This would necessitate the fitting of smoke seals and intumescent strips to all of the hotel's 240 bedroom doors. Some 73 bedroom doors were not fitted with this technology.

The duty holder agreed that the bedroom doors did not meet the current standard but because they had been previously acceptable, insisted that they should still be acceptable. The fire-resisting doors had previously been accepted by the fire and rescue authority and were marked on the plan in the rescinded fire certificate issued under the previous legislation. However, not only had the fire certificate become obsolete when the previous legislation was replaced by the current regulations but the technology of fire-resisting doors had advanced since the doors were originally installed and accepted.

After considering depositions from both sides, the Secretary of State ruled that the enforcing authority had been incorrect in their perception of what constituted the standard of fire safety required by the regulation. The fire and rescue authority had failed to demonstrate that the lack of the new technology placed the occupants of the hotel at greater risk, while the duty holder had argued successfully that the risk would not be increased. In addition, the Secretary of State also concluded that, if and when, the bedroom doors were replaced or repaired, the duty holder must replace or repair them with doors that could achieve the current specifications.

This case thus highlights the necessarily subjective nature of what constitutes controlling risk *so far as is reasonably practicable*[128]. In the case of this hotel, the duty holder and the fire and rescue authority disagreed on this matter, with the Secretary of State endorsing the view of the duty holder. This subjectivity may explain why enforcement varies between different fire and rescue authorities, but it also points to the need for appropriate levels of expertise on which to base judgments of safety.

Summary

Analysis of fire and rescue service enforcement data suggests that there is wide variation and inconsistency in the way that regulatory oversight operates in different parts of the UK. The case studies described also demonstrate failings in the system, as well as raising a number of other issues which suggest that self-regulation by fire risk assessment is problematic. They show issues with the competency involved in self-regulated fire risk assessments, and a lack of rigour in the implementation of the fire risk assessment process. Whether a typical fire risk assessment would have uncovered the building defects in Lakanal House, or at least alerted the duty holder to look deeper, is an intriguing and unanswered question.

The fire risk assessment is at the core of self-regulation, its effectiveness is directly affected by the black-boxing of fire safety knowledge in the fire safety design. The conclusions of the fire risk assessment must act to maintain the components of the fire safety design if the construction of the building and its occupancy are to conform to the original assumptions of the building designer. If this is not the case and the construction of the building or its

[128]For a definition of *so far as is reasonably practicable*, please see: http://www.hse.gov.uk/risk/theory/alarpglance.htm but also see Subsection 4.3 in Chapter 4 on page 89 for a measure of its importance.

occupancy have altered in a material way from those assumptions, then the conclusions of the fire risk assessment must act to alter the fire safety design to account for the divergences. However, as is apparent from the above cases, the effectiveness of the fire risk assessment process is being thwarted in its task. Several of the cases also indicate that the lack of importance invested in the fire risk assessment process results in little or no effort being made to carry out the process satisfactorily. Others indicate that although an effort has been made, little understanding of the components of the fire safety design has been demonstrated. The situation is not assisted if black-boxing means that the components of the fire safety design have been obscured.

The process of fire risk assessment may be enthusiastically undertaken, but it is dependent on the correct distribution of competency and expertise. In the cases mentioned above the role of expertise is brought into focus, particularly in the case of Rosepark care home. Despite the fact that a duty holder may understand the responsibility of self-regulation and may decide that an external contractor offering expertise should carry out the fire risk assessment (or, for that matter, the electrical wiring), the competency and expertise of the external contractor is crucial to the process. However, not only is the competency of the external contractor difficult to assess but the ability of the duty holder to value the findings of the fire risk assessment (and thus the competency of the fire risk assessor) is also in doubt.

A tendency towards regulatory capture can be identified as a constant theme throughout the cases mentioned above. This analysis suggests that the self-regulating system is having mixed results because of the noticeable inconsistency in the application of the regulations. This is hardly surprising given the lack of relevant knowledge and qualification amongst the duty holders and the unregulated level of competency in the the supporting industry. The inconsistency is not just confined to the competency and expertise of the duty holders and their representatives, it is also apparent in the enforcement of the regulations by the fire and rescue authorities. One concern has to be that much of the performance of the regulations is hidden because of the large percentage of premises that are rarely visited by the enforcement authorities. However, the data also indicates that there are differences in the enforcement policies of the fire and rescue authorities. The differences strongly suggest that a company or business in one area of England and Wales may be more or less liable to receive enforcement activity than a similar company or business in another area of England and Wales. These differences are apparent in the data but, at the moment, there is little explanation as to why the differences exist.

Next chapter

The next chapter analyses some of the concepts broached in the above case studies and presents evidence from interviews with the main actors that may give more clarity to some of the issues.

Analysis

Introduction

This chapter presents the findings of the study and examines them in the light of the theoretical framework presented earlier in Chapter 2. Chapter 6 both provided quantitative analysis to demonstrate how enforcement of current UK post-construction regulations appears to happen unevenly between different fire and rescue authorities, and described examples of enforcement to highlight some key failings in current regulation. This chapter provides a more comprehensive analysis of explanations for these failings using quotes from relevant interviewees to support this analysis, and discusses the implications that result.

The regulation of post-construction fire safety, like all social regulation, is intended to assist in improving the quality of life of the community. It must create an acceptable balance between the benefits and risks of a technology, supporting innovation without being a burden on those affected by the regulation. According to the Better Regulation Task Force, set up under the Blair Government in 1997: ‘The job of government is to get the balance right, providing proper protection and making sure that the impact on those being regulated is proportionate’ (BRTF, 2003, p.1). Regulation should also be ‘predictable in order to give stability and certainty to those being regulated’ (BRTF, 2003, p.5).

With regard to the regulation of fire safety, up until the late 20th Century new regulations were typically introduced reactively; often drawn up as a result of pressure from an anxious community or as a consequence of some tragic and public failure. Recent decades have seen radical change that can be traced back to the 1980s in England and Wales when, under the Thatcher

Government, in respect of pre-construction regulation, the building regulations were amended and the Approved Inspector regulations were enacted under the Building Act (1984). Both of these sets of regulations introduced far-reaching change. For example, the Building Regulations (1985) swept away local building acts, such as the London Building Act, and were applied nationally. They were fundamentally different from the regulations they replaced because they expressed their requirements in functional rather than prescriptive terms. Functional requirements 'were intended to be more flexible in use for the designer and/or builder ... the 1976 Regulations contained mandatory technical solutions, which tended to lead to inflexibility in interpretation, stifled innovation and, in many cases, could be more costly than was strictly necessary' (Billington, 2005, p.32). Another change occurred in England and Wales with the enactment of the Building (Approved Inspectors etc.) Regulations (1985). This legislation offered a choice of building control services between a private service with a new actor, an approved inspector, or the existing actor, the public service administered by the local authority.

The shift towards deregulation has also induced radical change in post-construction fire safety regulation resulting in an increase in the responsibilities placed on duty holders whilst giving them the tools to regulate themselves. The imposition of Directives from European legislation in the 1990s changed post-construction fire safety regulations by necessitating a proactive rather than a reactive approach to fire safety regulation. The approach has culminated in the enactment of the current fire safety regulations.

Up until the introduction of the current post-construction fire safety regulations it was the regulator, the fire authority in most cases, who surveyed the fire hazards and determined the risk to life in premises. The regulator then set out the steps the occupier needed to take to remove or reduce the risk to life, in order to create a safe environment to occupy. The regulator persuaded the person responsible to do the work and threatened with prosecution any that refused. Now, the regime is radically different. The responsibility for determining the steps that need to be taken have been removed from the regulator with the duty holder now being required to regulate themselves. Now, not only do duty holders need to create and maintain a safe environment for staff and visitors to occupy, but they also have to monitor their own performance in doing so. What was once the responsibility of the fire authority is now the responsibility of the duty holder, the one who has control over the premises. The role of the regulator has altered to become one similar to a police authority or the Health and Safety Executive. Both a police authority and the Health and Safety Executive approach a situation where they have jurisdiction with an interest in the way that the regulations that they have responsibility for are being applied. They form a view on what they find and then they decide on a course of action; either no action or some form of enforcement action. They are evaluating how those being regulated have interpreted and utilised the regulations in the unique set of circumstance that prevails in their premises. This, for a fire and rescue authority, was a significant change from their previous regulatory role.

Fire safety designs and the black-boxing of knowledge

Research Question 1: *To what extent does the black-boxing of knowledge in fire safety designs hinder the maintenance and management of post-construction fire safety?*

Black-boxed fire safety knowledge

Under current fire safety regulations, contact with the regulator is typically limited and the self-regulator, the duty holder, is usually free to apply the regulations in whatever way they see fit. The requirement for duty holders to produce fire risk assessments that are adequate presupposes an understanding and knowledge of the regulations as well as a capability to take measures to meet them. Assuming that they are aware that they are the duty holder responsible for fire safety in a premises, and have read the regulations, they will be aware of the need to carry out a fire risk assessment and take appropriate actions to maintain a safe workplace. However, a key challenge in this process is the expertise necessary for understanding the building's fire safety design.

The problem may be that aspects of the design, and of the scripts for the user embedded in the design by the designer, are black-boxed (Mackenzie, 1990; Winner, 1993; Latour, 1999). This means that the overall socio-technical approach designed to produce a fire-safe environment in a specific building will be in part opaque to managers and building users. However, although black-boxing represents 'something the inner workings of which need not be known for it to be used' (Sismondo, 2004, p.120), there is still an assumption that the duty holder has the expertise to understand the actions necessary for it to operate correctly.

This black-boxing of fire safety design poses a key challenge for the UK system of self-regulation of post-construction fire safety: to what extent can the person carrying out the fire risk assessment know how the originally approved fire safety design is intended to work? The most obvious mechanism to help this is the knowledge transfer process typically referred to as Regulation 38 which (in England and Wales) requires that the 'person carrying out the work [of the original design] shall give fire safety information to the responsible person' (Building Regulations, 2010, s.38). In Scotland, the same function takes the form of the Fire Safety Design Summary, a completed template, that is lodged with the approving authority and made available to the duty holder (Building (Miscellaneous Amendments)(Scotland) Regulations, 2013, s.3).

The fire safety design encompasses the installations, resources, and fire safety expertise considered necessary to meet the requirements of the pre-construction regulations. Thus, the fire safety knowledge embodies (and to some extent black boxes) the underlying theory of how a fire in the building can be prevented, detected, suppressed (in some cases), and its growth and spread beyond the fire compartment of origin minimised. The pre-construction regulations require that the fire safety design knowledge is packaged and made available to the post-construction duty holder. It is intended to assist the duty holder with the responsibilities conferred by post-construction fire safety regulations. However, there is no obligation for the duty holder to retrieve the knowledge or to attempt to comprehend it; indeed there is no explicit mention of this pre-construction knowledge in the post-construction regulations. It is as if the pre-construction regulations require a package of information to be put together and left for the building user to (possibly) use as they occupy the building; except that the building user is neither expecting a package to be left for them nor are they expecting to discover it if it has not been left somewhere obvious.

It is clear from a wide range of interviews with key stakeholders that there are two main flaws in this mechanism: (1) the required fire safety information is rarely used to assist the duty holder with post-construction regulatory responsibilities; and (2) even where the fire safety information is used, it may be of limited value because it is inadequate in some way and/or the duty holder is unable to interpret and utilise it.

Although the purpose of the fire safety knowledge is to assist the duty holder with post-construction fire safety regulations, there is little guidance connected with this for the duty holder. For example, although the recipient of the fire safety information should be the duty holder, identification of this individual may not be obvious until the building is occupied. The regulatory instruction (in England and Wales) is that 'fire safety information shall be given to the responsible person at the completion of the project or when the building or extension is first occupied' (Approved Document B, 2010, Appendix G, s.1). This creates a conundrum for the building designer to solve, because the identity of the duty holder may not be clear until the building has been occupied. The situation is further confused because although the role of the duty holder is set out in the post-construction fire safety regulations, parts of the duty holder's responsibilities may be held by other individuals. This is a consequence of the manner in which the regulations have been written and the provision that the duty holder can be anyone 'if the workplace is to any extent under his control' (Regulatory Reform (Fire Safety) Order (2005, s.3(a)) and the Fire Safety (Scotland) Regulations (2006, Explanatory Note, p.19)).

The amount of pre-construction fire safety information is dependent on, amongst other things, the age of the building. Generally, the newer the building, the more likely it is that pre-construction fire safety information will be available. However, even for buildings constructed or altered after the regulations were introduced in 2007 (England and Wales) and 2013 (Scotland) it appears to be common for the fire safety information to have been misplaced. One fire risk assessor commented that 'generally, you ask for that information but you don't get it. The people that you speak to, normally the building manager, they don't have that information. I can't ever recall a building manager that has said to me, "yes, this is the design for fire safety within this building."'[129]. Another fire risk assessor commented 'it is very, very, very rare that you actually go into a building and find that you've got the information about how the building is designed. In fact, in all honesty, I've been doing [fire risk assessment] for too many years, and I've never, ever seen it'[130]. Yet another fire risk assessor commented, 'we'll park Regulation 38 for a minute because that, I think sometimes, is an urban myth'[131].

The fire safety information is intended to fill the probable lack of expertise held by the duty holder. However, the information prepared for this purpose is rarely available even though it is a regulatory requirement[132]. Bullock and Monaghan (2014c) note that the absence of pre-construction fire safety information in the post-construction environment is so widespread that the situation could be described as endemic. They put forward some possible reasons for its scarcity, including: (1) the regulation is ineffective because the responsibilities are poorly defined; (2) the regulatory process is poorly monitored by the pre-construction regulator; and 3) the pre-construction regulator is reluctant to raise any objection that may delay a construction project at a pivotal stage in the plan approval process. The apparent lack of ownership of the issue comes from 'a mixture of ignorance and unwillingness' leading to a 'collective sloping of shoulders around the project team table when it comes to responsibility for fire safety' (Bullock and Monaghan, 2014b, p.30).

Sometimes the fire safety information is provided but it is inaccurate. BRE (formerly known as The Building Research Establishment) guidance on the relevant regulation points to an anomaly in the way that a building design

[129]Interview with a fire risk assessor: No.4: Nov 2014.
[130]Interview with a fire risk assessor: No.17: Jan 2015.
[131]Interview with a fire risk assessor: No.10: Dec 2014.
[132]Interview with a fire safety consultant: No.12: Jan 2015.

progresses to completion in connection with the transfer of fire safety information[133]. When a building design is of sufficient complexity that the services of a fire safety consultant are required, the ensuing contract is usually fulfilled following the approval of the fire safety design by the pre-construction regulator. However, this may be some time before the construction of the building has reached completion. Part of the contract will have been to document the fire safety information required to be transferred following completion of the building. In certain circumstances, there may be a late change to the building design after the conclusion of the fire safety consultant's contract and, thus, also following the documentation of the fire safety information. If the change to the building design affects the validity of the already documented fire safety information, there is no fire safety specialist present during the later stages of construction to examine and verify this or to amend the documentation. The result may be that the now *incorrect* fire safety information is transferred on building completion and that the post-construction fire risk assessment and fire safety arrangements may be predicated on inaccurate fire safety information.

Even if the correct fire safety information is available and the knowledge transfer process works as expected, considerable scepticism exists as to its value in facilitating the fire risk assessment. The requirement to provide fire safety information has not necessarily improved the situation as, in many cases, the documented information is of poor quality. This may be due to the author's inability to adequately explicate the philosophy behind the fire safety design in sufficient detail to explain the black-boxed features and their requirements for operation and maintenance. It may also be that the documented information does not include important tacit knowledge that was used in the initial creation

[133]Source: https://www.bre.co.uk/page.jsp?id=3184 (accessed on 15 Dec 2018).

of the fire safety design[134]. One fire safety adviser for a large organisation commented, ‘it’s often difficult to be flexible with buildings and, without the original fire engineering concepts ... it makes it difficult to manage fire safety properly’[135].

Incorporating the correct amount of information whilst accounting for tacit knowledge and pitching the level of explanation to individuals with unknown levels of knowledge and competence is a tall order. Some of the concepts used in the creation of a fire safety design are common currency in the world of fire safety engineering but are, understandably, not so common in the world that the duty holders of buildings inhabit. The regulatory requirement to document fire safety information raises fundamental questions about the process of knowledge transfer. Who converts and documents the knowledge and how? Who decides the details of how the documents are transferred? Who makes sure that the documents are read, properly assimilated, and utilised correctly?

The process represents the simplest model of communication, the linear model which consists of three components: (1) the sender of the documents (the building designer); (2) the transfer of the documents (the fire safety information); and 3) the receiver of the documents (the duty holder) (West and Turner, 2006, Figure 1.1, p.13). The linear model of communication can be visualised as a politician giving a speech at a political rally. There is little opportunity for feedback from the audience and no mechanism for making sure the meaning of the speech was understood correctly.

Lack of information about the original fire safety design can have serious consequences, not just for the ability of the duty holder to carry out a fire risk assessment, but also for the long-term maintenance of building safety. If

[134]Interview with a fire safety adviser: No.19: Jan 2015.
[135]Interview with a fire safety adviser: No.20: Jan 2015.

aspects of the fire safety design are black-boxed and opaque to building users, then this lack of information can be crucial. For example, fire-resisting doors are usually tested and certified as a complete door-set capable of preventing the passage of heat and smoke for a certain period of time of exposure to a prescribed, standard temperature versus time curve. Fire-resisting door-sets are expensive but well-made, and with care and sufficient maintenance they can last and perform well for a long period of time. A building manager faced with increasing maintenance costs because of poor quality normal doors might choose to replace all internal doors with fire-resisting door-sets. Initially, this may seem like a good idea except that a problem may arise when, because there is less money allocated to the budget, the building manager has to make economic choices and only wants to maintain the doors critical to the fire safety design. On the face of it, there is no problem because doors not required to be fire-resisting door-sets do not have to be maintained as fire-resisting. However, without prior fire safety knowledge or a good understanding of the fire safety design for a specific building, determining which doors need to be fire-resisting and, are therefore critical to the fire safety design, can be confusing. Confusion may ultimately lead to both a decrease in the level of safety and a regulatory breach[136].

The available guidance in respect of the content of the fire safety information is comprehensive in its scope and points to information about the equipment and installations such as the fire alarm system, the emergency lighting system, as-built building plans, and so on. However, there is no guidance that indicates how the information should be explicated, handled and presented for best effect on the individual (duty holder) for whom it is intended. This can present a high hurdle if the information has not been tailored specifically for the

[136] Interview with a fire safety enforcement officer: No.11: Dec 2014.

recipient because ‘unless you’ve got someone that understands the theory and the practice of what has been documented, then the challenge of understanding those concepts and using them to manage the building effectively is quite high’[137]. As-built plans are recommended in England and Wales by Approved Document B (2010, Appendix G, pp.147-8), and marked up drawings with key fire safety information are recommended in Scotland[138], for both simple and complex buildings, showing the location of the equipment and installations of the fire safety design. Some fire safety advisers think that an informative plan is sufficient knowledge to be transferred for a building built to a prescriptive code but that ‘it should be accompanied by a written fire strategy report where the building has a fire-engineered design feature’[139]. A written report is necessary because, as one fire risk assessor put it: ‘Plans can help you but they don’t help you understand the building, do they?’[140].

Prescriptive and performance-based fire safety designs

Two factors seem key to the value of the fire safety information: (1) the competence of the assessor; and (2) the type of fire safety design involved. While historically UK building designs were approved on the basis of compliance with prescriptive requirements, it has been possible in recent decades to gain approval for bespoke performance-based design solutions. In some cases, buildings are designed from scratch with a performance-based design fire safety solution that enables innovative architecture and/or the use of new materials. However, increasingly, there are significant numbers of buildings being approved that are largely prescriptive in nature but have small, but perhaps

[137] Interview with a fire risk assessor: No.13: Jan 2015.
[138] Source: http://www.gov.scot/Topics/Built-Environment/Building/Building-standards/ProceduralLegislation/firesafetydesign (accessed on 15 Dec 2018).
[139] Interview with a fire safety adviser: No.27: May 2015.
[140] Interview with a fire risk assessor: No.13: Jan 2015.

crucial, elements of performance-based design used to provide a fire safety solution that enables an innovative or more commercially viable building.

Where a building is designed entirely according to prescriptive rules the fire safety information package may be less important in aiding the fire risk assessment because these codes are readily available and widely known in the industry. However, the duty holder or assessor still needs to know whether the building was prescriptively approved in the first place. As one fire risk assessor put it: 'I need to see that [package of fire safety information] because, without it, I don't know what the design vision is. It may only be a simple building but I don't even know whether the design is performance-based or whether it came from a prescriptive standard?'[141]. Not being able to determine this basic knowledge of the fire safety design places the fire risk assessor at a disadvantage from the outset. Reverse engineering is a common, and, in many cases, the only strategy available to gather together information about how the building was designed: 'It's a bit of a detective exercise, really. Looking at the evidence and working out what the strategy was from the evidence'[142].

Perhaps the regulatory requirement for the transfer of information suffers from a noticeable amount of scepticism about whether the fire safety information is needed at all. A view expressed by a fire safety enforcement officer reflected that the need for some of the fire safety information can be adequately countered by experience. This reflects the view that if you are a competent fire risk assessor and you have sufficient experience and knowledge, then you should have the ability to deduce the fire safety design. For example, even if all the doors have been installed to the standard of fire-resisting doors, 'it's your experience, education and knowledge that tells you which should and which

[141] Interview with a fire risk assessor: No.10: Dec 2014.
[142] Interview with a fire safety adviser: No.19: Jan 2015.

should not be a fire door'[143]. This point of view seems old-fashioned given that it is based on an infallible ability to identify the compartment walls of a fire safety design. However, one of the trends associated with performance-based design is that it enables larger open spaces by the replacement of compartment walls. The concept of compartment walls in many fire-engineered buildings has been replaced by a system of smoke control[144]. Smoke control is typically achieved by the use of engineering concepts to control the constituents of fire: the temperature of the fire, the pressure differences caused by heat, the buoyancy of the smoke, and so on. Bearing this in mind, the concept of a fire risk assessor correctly deducing the components of the fire safety design without benefit of the fire safety information begins to appear unrealistic.

Even when a building has been approved on the basis of compliance with prescriptive codes, there may still be an element of performance-based judgement (i.e. code interpretation) in so much as the codes are rarely black and white for all cases. Regulators may vary in their interpretation of prescriptive codes and it will be helpful for the duty holder to know whether a prescriptive design was approved on this basis. Because prescriptive codes are generally broad-brush, *one-size-fits-all* in nature, many of the buildings thus approved are considered, according to one fire safety consultant, as 'forgiving buildings'[145]. The concept suggested here is that older more traditional buildings are easier to manage because in respect of fire, they are over-engineered: 'if the building has been designed to a prescriptive code, you will probably get away with two management failures, maybe even three, before it all comes

[143]Interview with a fire safety enforcement officer: No.11: Dec 2014.

[144]The concept of a smoke control system pre-supposes that the greatest risk to occupants in the early stages of a fire in a building is the inhalation of smoke and works to reduce that risk.

[145]Interview with a fire safety consultant: No.23: Feb 2015.

tumbling down like a pack of cards'[146].

The challenge presented by performance-based design buildings is different because a wide range of potential solutions are possible, and their underlying principles may be grounded in state-of-the-art fire safety science and intensive use of modelling software. Moreover, because key elements of a performance-based design fire safety solution may be black-boxed, critical operational requirements may not be evident to a duty holder or fire risk assessor. This may be especially so if they lack knowledge of the techniques used by the original designer or do not have deep competence in fire safety engineering principles. Thus an ex-fire safety enforcement officer was sceptical of the view held by some of his former colleagues that modern fire engineered buildings did not have to be inspected so often because their design was based on sound principles. His own view was quite the reverse: 'modern fire-engineered buildings need to be inspected more regularly because fire safety management is a critical element in the building. People don't fully understand the engineering principles involved'[147].

The same opinion was given by a fire risk assessor who agreed that 'buildings with fire-engineered solutions depend on people maintaining them correctly'[148]. His experience told him that, generally, people did not maintain modern buildings correctly and that, on some occasions the perceptions of duty holders were plainly wrong. When, while carrying out fire risk assessments he asked for systems to be tested, sometimes they did not operate as he had been led to expect. He thought that this type of situation arose because building users, on the whole, receive no training in how to maintain the fire protection systems. They inherit a black-boxed fire safety design and are expected to

[146] Interview with a fire safety consultant: No.23: Feb 2015.
[147] Interview with a fire risk assessor: No.15: Jan 2015.
[148] Interview with a fire risk assessor: No.10: Dec 2014.

manage it effectively without any prior training or preparation. Fire safety engineers are aware of this particular inadequacy and complain about the general lack of fire safety education amongst the duty holders. For example, one fire safety engineer complained that in his designs he makes sure that all fire-resisting doors are properly signed, yet on re-visiting buildings, he often finds fire-resisting doors propped open: ‘If a door is fitted with a sign saying, "KEEP CLOSED", why don’t people keep it closed? Maybe some education is needed to explain the purpose of a fire-resisting door’[149].

Any technician who carries out work on fire protection installations, which could include the fire alarm system, the sprinkler system, the smoke vent system, and so on, could be unaware that they are relying on their personal expertise rather than the fire safety information that may or may not be available. The nature of prescriptive codes means that buildings conform, broadly, to similar solutions to the problems of building design. This could lead to the tendency for a technician to interpret the relationship between design features and fire installations in a way that fits in with personal experience working in buildings built to prescriptive codes. The tendency to interpret what we see without looking further because it looks familiar is referred to as *confirmation bias* and, in building design coupled with incorrect knowledge, could lead to a wrong interpretation.

This raises a key parameter with regard to the capacity of duty holders/fire risk assessors to make use of any fire safety information package that is available – their levels of expertise and competence.

[149]Interview with a fire safety engineer: No.18: Jan 2015.

The Distribution and Application of Fire Safety Knowledge and Expertise

Research Question 2: *How is fire safety expertise distributed amongst the key actors in post-construction fire safety and how is competence regulated?*

Expertise and Epistemic Authority

The self-regulation ideology underlying current UK post-construction fire safety hinges on the role of the duty holders in producing an effective fire risk assessment and incorporating its risk control measures into an effective management system. There is no statutory requirement for expertise amongst any of the actors involved in self-regulation except for the requirement written into the regulations that the individual assisting the duty holder is to be regarded as competent where she 'has sufficient training and experience or knowledge and other qualities' (Regulatory Reform (Fire Safety) Order (2005, s.18(5)) and Fire Safety (Scotland) Regulations (2006, s.2(1), "competent" (c))).

Expertise and competence do not have the same meanings; the word expertise suggests that an individual possesses 'superior skills or knowledge in a particular area of study', whilst, the word competence suggests that an individual 'has the ability to do something satisfactorily' (Herling, 2000, p.9). For a fire risk assessor to be considered competent she would have sufficient training and experience or knowledge in fire safety (i.e. sufficient expertise) and be able to apply it to a satisfactory standard when carrying out a fire risk assessment.

In the previous regulatory regime, because of where the regulatory power lay, many pre- and post-construction actors were content to allow the regulators to use their expertise and competence to determine the correct fire safety design for a building, and to specify how the building was used. This was, after all, the easier option in the prescriptive, bureaucratic world of fire safety in buildings but this did not mean that it was problem-free: ‘two fire officers can look at a building and they could come out with different solutions ... and there’s no saying that one is particularly right and one is particularly wrong’[150].

In the current regulatory regime, the rise and development of performance-based building design coupled with the introduction of self-regulation has altered the balance of expertise and the need for competence in both pre- and post-construction environments. The greater need for expertise and competence, in many cases in the pre-construction environment, lies with the building designer, particularly in a building designed to a performance-based design. The greater expertise and the need for competence in the post-construction environment, in all regulated premises, lies with the self-regulator, the duty holder of the premises.

In respect of the post-construction duty holder of a premises, their expertise or competence can be quite specific and is unlikely to be expertise or competence in the discipline of fire safety. This was described succinctly by one fire risk assessor as ‘asking an hotelier to do a fire risk assessment is like asking a fire officer to cook a six-course Cordon Bleu meal, it’s impossible! You can’t expect the average hotelier to do a fire risk assessment’[151]. Yet, what is expected of the duty holder is that they (or a person appointed by them) is an individual (or individuals) with sufficient expertise in fire safety knowledge to apply that expertise to a satisfactory standard.

Fire risk assessment templates are available and offered as an aid to a duty holder in carrying out regulatory responsibilities. Using a template can

[150] Interview with a fire risk assessor: No.4: 5 Nov 2014.
[151] Interview with a fire risk assessor: No.4: Nov 2014.

seem like a good idea and they can be easily found and downloaded from the internet. Generally, they follow a simple tick-in-a-box format alongside a list of relevant questions. However, the simplicity and convenience of a template is misleading because considerable expertise and competence, equivalent to ‘interactional expertise’ (Collins and Evans, 2007, p.28), may be necessary to answer the questions correctly. For example, a typical question asks: is there a fire alarm system installed in the building? Followed by a second question: is the fire alarm system adequate? Both answers attract either a *yes* tick or a *no* tick. Answering *yes* to the first question is quite simple, if indeed there is a fire alarm system installed in the building. However, answering the second question on the adequacy of the fire alarm system is anything but simple. The correct answer needs access to, and an understanding of, a host of other knowledge about the fire safety design in the building. The fire risk assessor needs to know why the fire alarm system was originally installed and, crucially, whether the criteria requiring its installation still apply? The type of occupancy, the use of the premises, or the business processes may have altered to the extent that, either the fire alarm system may not now be required, or perhaps a more comprehensive or different fire alarm system may now be required. Perceiving differences between the fire safety design, the black-boxed components, and the current use of the premises is expertise that a competent fire risk assessor should possess. It is not unreasonable to expect that a competent fire risk assessor offering a service to duty holders would have the necessary expertise to be able to carry out a fire risk assessment on the most prevalent types of premises to a satisfactory standard.

The range of fire safety knowledge available in connection with fire safety in buildings is extensive and includes subjects such as: the dynamics of fire behaviour and how occupants will react when fire occurs, how the structure of the building will respond to heat and smoke, and how the operation and management of the premises will influence both the likelihood of a fire occurring and the behaviour of the occupants when that situation occurs. From their analysis, a fire risk assessor would be able to assess the risk from fire in the unique circumstances of the individual premises under assessment and make a judgement on how a fire and the occupants of the premises would behave. Their competence would include being able to question perceived anomalies in the fire safety design and their expertise would include either being able to answer them or to recognise that they could not. For example, if there is a means of escape with a travel distance that looks overlong, a competent fire risk assessor would question the reason for that. They would ask themselves questions such as: ‘The travel distance is extended but you also have an extract system, so is the extract system a compensation for the extended travel distance?’[152]. Having completed their analysis and made their judgements the fire risk assessor would be able to formulate an accurate and definitive action plan that could support a duty holder in effectively maintaining a safe environment in respect of fire.

The regulatory definition of competence is mirrored in the document *Competency Criteria for Fire Risk Assessors (2011, p.4)* but the key question this raises is how much training and experience or knowledge would be regarded as sufficient? A health and safety manager of a medium-sized company was faced with the decision of who should carry out the fire risk assessment of the two-storey offices in which the company was based; the decision was to carry it out in-house. The reasoning for this decision was that ‘if ever I was questioned as to why did you feel you were competent to do the risk assessment for this building, I’d be able to say, "well, it’s a low risk building, I have been

[152]Interview with a fire risk assessor: No.18: Jan 2015.

successful on a two-day risk management course and I do understand the principles of fire because I teach them for [National Examination Board for Occupational Health and Safety]"'[153]. This explanation expresses confidence that sufficient competence is available to sufficiently understand the fire safety design to maintain a safe environment. It also reflects another need faced by duty holders, the need to, not only, make a decision but also to justify the reasons for making the decision. One of the needs in British courts is the need to show that, even though you did not achieve your goal, you showed sufficient diligence to prove that your intentions were to achieve your goal.

An important self-measurement of a fire risk assessor is that of being able to measure their own expertise and competence. To decide, half way through the task of carrying out a fire risk assessment that sufficient expertise to complete it is lacking, is to make a mature, if awkward, decision. As one fire safety manager put it, 'I'm not afraid to look at the advice and guidance that has been published and I know it exists there in the background if I need it. I think I knew enough to carry out a fire risk assessment for a low-risk building'[154]. However, measuring one's own competence is notoriously risky if the experiments carried out by Kruger and Dunning (1999) are any indication. Their research suggests that individuals with low abilities may tend - counter intuitively - to overestimate their own expertise and competence.

Generally, it seems to have been accepted that former firefighters, because of their careers dealing with fire incidents, would make satisfactory fire risk assessors with the widespread perception that their fire fighting experience confers *epistemic authority* when dealing with matters of fire safety. Thus, as noted earlier in this thesis (in Chapter 2), the Holroyd report in 1970 argued that

[153] Interview with a fire safety manager: No.9: Dec 2014.
[154] Interview with a fire safety manager: No.9: Dec 2014.

'only men with practical fire-fighting experience can properly assess the adequacy of the fire prevention provisions made in particular premises, since only they have an adequate knowledge of what constitutes the chief fire dangers, the way in which fire is likely to behave in the particular circumstances of the occupancy and the likely reaction in a fire of people in the building' (Holroyd, 1970, para.383. p.164). However, whilst firefighters may have had the greatest claim to epistemic authority in 1970, the situation has changed since due to the increasing use of science-based fire safety engineering in building design. A former firefighter's expertise and competence is associated with their specific career path through the service and influences their suitability to pursue fire risk assessment as an alternative career. In particular, the increasing use of performance based design means that some premises will have fire safety designs that require a level of expertise in fire safety engineering that will be beyond the capacity of the typical retired firefighter. A former firefighter may have 'contributory expertise' (Collins and Evans, 2007, p.24) in firefighting in many types of premises but that does not mean to say that that expertise counts towards assessing fire risk in any type of premises. A former firefighter may have contributory expertise in the regulation of fire safety in many types of premises but that does not mean to say that that expertise counts towards assessing fire risk in every type of premises. Hospitals, for example, are specialised premises and to reflect their difference in respect of their fire safety design, they are equipped with their own distinct set of guidance documents. It would be foolish for any fire risk assessor to attempt a fire risk assessment in a hospital without sufficient expertise in the *Health Technical Memoranda (HTM)* fire safety guidance.

Whether a person possesses sufficient knowledge and experience of the premises under assessment gives rise to another dilemma faced by the duty holder about whether or not a fire risk assessor should be an internal employee or an external contractor. The dilemma involves determining the importance of the knowledge and expertise necessary for each of the two categories. For example, the internal employee is likely to have greater knowledge and understanding of the operation and management of the premises whilst the external contractor is likely to have greater knowledge and understanding of the science of combustion and the effects of fire in buildings. One way to tackle the dilemma is, of course, to engage a team of fire risk assessors containing knowledge and understanding of both categories.

The document *Competency Criteria for Fire Risk Assessors (2011)* purports to be comprehensive about the criteria needed for competency in fire risk assessment but it fails to fully address this dilemma. The document is wide-ranging in the subjects needed to be understood by a fire risk assessor in respect of legislation, behaviour of fire, means of escape, fire prevention and protection, management of fire safety, and so on. The document acknowledges that expertise is required in many areas of fire safety knowledge but it generalises about the specific knowledge that is needed. For example, if you examine one of the criteria: ‘Understand that all persons within the premises should be able to reach a place of ultimate safety before life-threatening conditions arise; either unaided or with the assistance of staff – without FRS [fire and rescue service] assistance’ (Competency Criteria for Fire Risk Assessors, 2011, p.14) - it uses concepts that are undefined. Concepts with regard to what constitutes ultimate safety, or life-threatening conditions, or the role of the fire and rescue service, and so on, are often subjective definitions. They are concepts familiar to fire safety practitioners who have, most likely, defined them as a result of their own particular experiences. Unfortunately, this means that one individual’s definition of such concepts is likely to be different to another’s.

One fundamental difficulty with the document, *Competency Criteria for Fire Risk Assessors (2011)*, is that it is lacking in the area of knowledge that deals with fully understanding the operation of the premises and the organisation and behaviour of the people that occupy it. This is the area of knowledge that an internal fire risk assessor would be likely to have greater contributory expertise in than would an external fire risk assessor. The omission is apparent in the criteria where the fire risk assessor should '[b]e able to apply an understanding of fire hazard and fire risk in the premises in context, to make an informed judgement on the appropriate level of fire precautions in the premises where the fire risk assessment is being carried out' (Competency Criteria for Fire Risk Assessors, 2011, p.6). To fulfill the criteria requires specific knowledge of the operation and management of the premises. Expertise in this area would allow the fire risk assessor to note any anomalies in the operation of the workplace and suggest the pertinent questions to ask to solicit the correct information. For example: 'this is what I see today but I can tell that this isn't how you use the place normally. You must do some welding sometimes because I can see some welding equipment over there'[155]. To fully understand the operation and management of the workplace, the fire risk assessor has to know all of the possible ways that the premises might be occupied under all of the possible conditions and influences. Eliminating the least likely possibles and concentrating on the most likely possibles for a specific premises, involves knowledge and experience in all of the possibles for that specific premises. It is difficult to see how that knowledge and experience can be obtained without spending time on the premises, becoming familiar with what happens during the day or the night, both on a weekday and at the weekend. Documented research assists actors such as the fire risk assessor with understanding the various ways

[155]Interview with a fire risk assessor: No.4: Nov 2014.

that building structures, building materials, and building occupants behave under emergency conditions such as a fire emergency. There is much less documented research to assist the fire risk assessor in understanding how management systems utilise information about the fire safety design, how they maintain the black-boxed components of the fire safety design, and how they prepare for the possibility of a fire emergency.

There is yet another issue to resolve with regard to engaging an external fire risk assessor. It could be argued that even though an external fire risk assessor is the best choice, because they are visitors only to the premises they may not have much interest in finding the optimum solutions for controlling the fire risk. Their commitment in carrying out the fire risk assessment conscientiously may only extend as far as they value their fee and their prospects of repeat business: 'they charge a fortune and then walk away. They don't even come back to see if any of the recommendations have been achieved'[156]. In contrast, the commitment of an internal fire risk assessor is potentially greater. They may be more interested in finding the best solutions for the issues they uncover as they are directly accountable for the consequences of their recommendations. For example, a fire safety adviser carrying out fire risk assessments on the university campus for which he was employed pointed out that 'I will include a completed by date for when the recommendations should have been completed, and I am on hand to investigate what has been done as well as review what has not been done because of unforeseen circumstances'[157].

This particular view was endorsed by the fire safety adviser for a large organisation who suggested that engaging an external fire risk assessor did not necessarily result in the most effective fire risk assessment. He commented:

[156] Interview with a fire safety adviser: No.5: Nov 2014.
[157] Interview with a fire safety adviser: No.5: Nov 2014.

'I think when an independent fire risk assessor comes into a company on an inspection they cannot fully understand the work processes and the type of people who work there. So they stick rigidly to the guidance documents because they don't want to be accountable for any wrong assumptions they make. Where a person employed at that company carries out the fire risk assessment, he knows how the systems work, he understands the use of the buildings, and he can be a little bit more flexible when using the guidance documents'[158]. Being *a little bit more flexible when using the guidance documents* means tailoring the relevant advice to suit the changing environment that may exist in the premises. The risk is that an external adviser with expertise in fire dynamics will produce a fire risk assessment that only takes account of that expertise. Furthermore, they may be unwilling to use that expertise in the most advantageous way. This situation may be of little effective use to the duty holder who may not even realise the inadequacy of the completion of the task.

In addition to showing the correct amount of consideration for the operation and management of the premises, it is important that an organisation is able to demonstrate good judgement in how it carries out its fire safety duties. For example, a university, conscious of its reputation, formulated a policy of how to choose a suitable fire risk assessor for its needs. It has decided that choosing a fire risk assessor who is a member of a fire risk assessor registration organisation will help to demonstrate that it has taken reasonable care in its choice should something go wrong: 'We have formalised the procedure by writing our criteria in our procurement policy. If you've secured a fire risk assessor by contract that gives you a level of confidence in the service he offers. You're not going to get any cowboys applying and I think it does root out the one man band, the senior fire officer who just does the job to keep himself in beer

[158]Interview with a fire safety adviser: No.5: Nov 2014.

money'[159].

The policy chosen by this particular university can be considered to be an effective policy because of the approval given to it by one fire and rescue authority. A fire risk assessor (formerly a fire safety enforcement officer), in conversation with a former colleague (a currently serving fire safety enforcement officer) was told, '[b]ecause the university [i.e the duty holder] picked someone off a recognised register, I would take that as demonstrating due diligence. They are not an expert in fire safety but they have gone through a correct process'[160]. By using the phrase *correct process*, the fire safety enforcement officer is reflecting the regard in which the fire risk assessor registration organisations (previously described in Chapter 5) are held by the regulator. This raises the question of how much regard should be given to the system of registration organisations governing the competence of fire risk assessors. Further, it also raises the question of how the organisations are reviewed and how their quality is assured. This issue will be further addressed in Section 7.4.1 below.

Expertise and the fire safety information

Because fires are comparatively rare, it is unlikely that a duty holder, when occupying a new building, will worry too much about understanding the finer points of the fire safety design. There are simply more pressing issues to deal with to do with solving the problems of employees, the business process, and so on. This brings into question the significance of the fire safety information required by Building Regulations (2010, s.38) and Building (Miscellaneous Amendments)(Scotland) Regulations (2013, s.3) (and previously discussed in Chapter 5 and also in Sections 7.2.1 and 7.2.2 of this chapter). How signif-

[159]Interview with a fire safety adviser: No. 19: Jan 2015.
[160]Interview with a fire risk assessor: No.15: Jan 2015.

icant is the information and how much expertise in it is required by the duty holder when maintaining a safe environment? How much knowledge about the black-boxed fire safety design is necessary in order to carry out a fire risk assessment? Can an adequate fire risk assessment be carried out without it?

A legacy of the prescriptive approach to fire safety regulation, and perhaps the perceived epistemic authority of fire fighters, means that some see fire risk assessment as a straightforward process for a sufficiently competent assessor. Thus, according to one fire safety enforcement officer the fire safety information is unnecessary because a competent fire risk assessor should be able to produce a suitable fire risk assessment without access to it: ‘I would hate to think that a fire risk assessor couldn't do his job because he hasn't got the requisite [fire safety information]’[161]. However, this opinion presupposes a particularly high level of expertise and competence amongst all duty holders (or the agents they employ) and points to a logical flaw with self-regulation. The underlying philosophy of self-regulation is that fire safety measures will be proportional to the risk, and thus that low risk buildings and businesses will not be overly encumbered with unnecessary fire safety measures (nor the regulatory authorities with checking them). The problem is that duty holders with little or no fire safety expertise cannot reasonably be expected to know the level of risk posed by their premises in practice, and thus what constitutes an adequate fire risk assessment for them.

In respect of fire safety information, a group of fire safety professionals may have the edge over an individual fire safety professional. An organisation of fire safety professionals such as a fire consultancy has the capability of generating its own shared database in respect of buildings in which it has had some involvement. This gives the consultancy control over fire safety

[161] Interview with a fire safety enforcement officer: No.11: 18 Dec 2014.

information that it has generated, creating a valuable asset in their service to their client. Consider the fire safety consultancy that has been involved in the pre-construction building design stage as a member of the building design team. As part of the contract, it has prepared the regulatory required documented fire safety information and lodged a copy on its own database. When the building is constructed, the consultancy may bid for and win the contract for fire risk assessment. In this case, the fire risk assessor, an employee of the consultancy, can benefit from the relevant fire safety information that is already available on the consultancy database. When the contract has been completed, the data from the findings of the fire risk assessment is also recorded in the consultancy's database thus providing a valuable history of the maintenance and/or amendment of the fire safety design[162]. The drawback, of course, is that the expertise is only available to employees of that consultancy and will only be utilised if the consultancy continues to be involved with the premises.

The fire safety consultancy is doing what the management of the premises should already be doing under its own fire safety arrangements. In a capable company, with a competent system of management, fire safety would receive the same attention as any other management issue. The fire safety manager would be aware of the entitlement to fire safety information, she would be actively questioning its absence, and making efforts to obtain the information. However, the lack of interest shown by building managers with regard to their fire safety responsibilities is such that it causes puzzlement among fire safety engineers. Bullock and Monaghan (2014a), for instance, note that: 'When taking receipt of a completed building surely the occupier should request adequate documentation to show what was built? How, otherwise, would they

[162] Interview with a fire risk assessor: No.16: Jan 2015.

know and be able to manage it properly?'

Regulatory capture of fire safety

Research Question 3: *Has deregulation of UK post-construction fire safety led to regulatory capture and, if so, to what extent, and in what form?*

Previous fire safety regulations in the UK were seen as bureaucratic, heavy on resources, and gave the regulated industry very few options. In respect of post-construction fire safety regulation, for those who were regulated, the previous bureaucratic regulations were transformed, overnight, into a light-touch regulatory regime. In fitting with the prevailing neo-liberal ideology within the UK regulatory environment, this move to a system mainly based on self-regulation was intended to promote innovation and economic activity by removing, as far as possible, the *'dead hand'* of the State[163].

Current post-construction fire safety regulation was brought in as secondary legislation under primary legislation. The intention of the primary legislation was to reform 'legislation which has the effect of imposing burdens affecting persons in the carrying on of any activity' (Regulatory Reform Act, 2001, s.1). Therefore it can be assumed that the repeal of the previous legislation was because it was considered to be overburdensome to business and the intention of the current legislation was to remove this burden. The introduction of the current regulations brought together a number of disparate pieces of fire legislation and consolidated them into one set of regulations relying on a risk-based self-regulated approach to compliance.

[163]For explanation and an opinion with regard to the *dead hand* of the state, please see the article available at http://www.telegraph.co.uk/finance/2874981/Chop-off-the-dead-hand-of-the-state.html (accessed on 15 Dec 2018).

Two aspects need to be considered to understand whether this approach to regulatory compliance has led to regulatory capture: (1) the behaviour of duty holders in self-regulating; and (2) the behaviour of the regulator in its residual role of carrying out fire safety audits for the premises considered most risky. Given that fire and rescue authorities only audit some premises then it is clear that UK post-construction fire safety is mainly reliant on self-regulation by duty holders.

The behaviour of duty holders can also be broken down into two main aspects: motivation and competence. Duty holders are likely to be motivated to carry out fire risk assessments because of concern about regulatory compliance and/or concern about the safety of themselves and other occupants of their building. Duty holders, however, are unlikely to consider themselves to have sufficient expertise or to be sufficiently competent to carry out fire risk assessments in any but the most simple of premises. The former is dependent on knowledge and awareness of the regulations whereas the latter is dependent on the duty holders' attitude to risk and their capacity to understand and address fire safety issues in their premises.

Two other factors influence the commitment of duty holders to carrying out their duties to their fullest ability: (1) deliberate commercial cost/benefit calculations, and (2) organisational inertia. Companies and organisations have a choice of how to comply with the regulations which means that the choice could be made on a corporate risk assessment, with criteria such as: how likely the company is to be visited by the regulator, how likely the regulator is to prosecute, how severe could the punishment be if the regulator did prosecute, and so on. Duty holders can decide whether to satisfy the regulations motivated by financial self-interest and not, necessarily, the interests of the staff and general public. The duty holder may know that the regulator operates by risk assessment and will spend time and resources monitoring the most vulnerable premises. It is no secret that these are typically premises where people sleep: hotels, hostels, sleeping accommodation above shops and public houses, and so on. So, in premises in which fire fatalities are rare, such as premises containing offices and shops for example, the duty holders know that they will not normally receive a visit from the regulator unless there is a reason for a visit. Possible reasons for a visit include someone making a complaint about a perceived lack of fire safety such as a locked or blocked fire exit, or a fire occurring in the premises requiring the presence of firefighters. Thus a duty holder knows that a visit by the regulator is not inevitable and, if a visit does occur, the duty holder can prevent further enforcement by a minimum of cooperation.

Even where organisations do not deliberately seek to minimise their regulatory burden, duty holders may be indifferent to their duties. Fire safety may be only one of many responsibilities, and given the infrequency of fires, focus on criteria related to fire safety is likely to be lacking when other matters are more pressing. Day-to-day routines may become established without benefit of fire safety and issues such as fire training or fire awareness may gradually be forgotten (Snook, 2000; Stollard, 2014). Because fires are rare unless fire safety is positively projected amongst a workforce, it can easily be ignored.

Setting the level of competence

To encourage expertise and raise the perceived standard of competence amongst fire risk assessors, independent organisations in the fire industry have developed a business model that offers registration for fire risk assessors. Registration provides certification for fire risk assessors with the claim that this means they are then considered competent to produce fire risk assessments that meet the required standard. Certification offers a client – a company or an organisation – confidence in contracting a certificated individual to carry out a fire risk assessment. The client benefits from this because it assists in the defence that they have taken reasonable steps to make sure the fire risk assessor was competent. Some of the registration organisations go further and add another layer to that assistance. In return for registration, they insist that the individual or company is inspected and monitored by an independent third-party organisation. This supports the position of the client by demonstrating that the fire risk assessor is taking steps to operate correctly which, in turn, infers that the client is taking steps to avoid committing an offence, typically referred to as showing due diligence.

Registration organisations are private organisations and some fire safety practitioners resent this, claiming they are just a new type of business model whose primary intention is to make money. One fire risk assessor commented, ‘I tend to see them more as money-making concerns rather than as certificates of competence’[164]. He claimed that the organisations have merely moved to fill a gap in the market left because of the Government’s reluctance to regulate the field. If correct, this represents not only a form of regulatory capture but also an act of business opportunism. Generally, the business model has much support even at the highest level in the fire industry: Sir Ken Knight, former Chief Fire and Rescue Adviser to the Government is reported to have said, ‘if you are a fire risk assessor and you are not third-party certificated? Shame on you. If you are a [duty holder] employing a fire risk assessor who isn’t third-party certificated? Shame on you, too!’[165].

For their part, the registration organisations and their supporters say that

[164] Interview with a fire risk assessor: No.4: Nov 2014.
[165] Interview with a fire risk assessor: No.16: Jan 2015.

if an individual has applied and succeeded in becoming a registered member after having gone through the membership process, then there are some assumptions that you can make about that individual. A registered member should be technically competent to visit a client's site and know the questions they need to ask to establish which regulations apply and which guidance to use. Having regard to the correct guidance and sufficient knowledge of the guidance documents should enable them to survey the premises competently and satisfactorily. If they can achieve this much, then this establishes the foundations for them to carry out an adequate fire risk assessment[166].

However, there is a view that the registration system needs further development: 'I think that the registration organisations still need some development. There should be one body and not several. A fire risk assessor could be members of the individual registers but affiliated to a central approval body'[167]. There are some precedents here when you consider registration schemes such as the Gas Safe Register[168] set up by Government to register and licence gas engineers, or the Registered Competent Person Electrical scheme[169] set up to register and licence the Competent Person Scheme Operators for electricians in England and Wales. These registration schemes are intended to enable qualified members to self-regulate their work but also function to standardise competence in work involving inherent dangers.

Perhaps the real value of the registration organisations rests on the credibility they offer to their members. Credibility is commercially important to an individual offering a service because it implies to a client that the individual has

[166]Interview with a fire risk assessor: No.13: Jan 2015.
[167]Interview with a fire safety adviser: No.5: Nov 2014.
[168]For more information on the Gas Safe Register, please see https://www.gassaferegister.co.uk/ (accessed on 15 Dec 2018).
[169]For more information on the Registered Competent Person Electrical scheme, please see http://www.electricalcompetentperson.co.uk/ (accessed on 15 Dec 2018).

the ability to carry out the service successfully. However, if the credibility of the registration organisation is in doubt, so is the credibility of the registered member. To maintain credibility, a registration organisation has to be transparent and open to challenge, with the resources to meet that challenge. Failure to do so means that credibility may also fail, as evidenced by one registration organisation faced with this challenge. A fire safety enforcement officer, concerned with the competence of the fire risk assessment he encountered during a fire safety audit, noted that the fire risk assessor was a member of one of the registration organisations. He approached the organisation and asked if they had a procedure by which he could challenge the competency of their registered member. The answer he received was that there was no procedure in place. Any member who had gone through the registration process and been conferred as a registered member remained a registered member unless they chose to relinquish their membership. The fire safety enforcement officer was thus led to pose (and answer) the rhetorical question: ‘Do the registers provide a means for a fire safety enforcement officer to challenge the competency of the fire risk assessments of individual fire risk assessors? No!’[170]. This indicated to the fire safety enforcement officer that there was no constitutional procedure by which competency could be challenged. The inadequate fire risk assessment was dealt with by enforcing the regulations but the fire safety enforcement officer was left wondering how much value he should place on any other fire risk assessor who happened to be a registered member of that particular registration organisation.

There is no need to become a member of a registration organisation and anyone can set themselves up as a fire risk assessor with or without demonstrating that they possess the requisite expertise and competence. There are

[170] Interview with a fire safety enforcement officer: No.29: Jun 2015.

no statistics that indicate how many fire risk assessors are active, nor are there any statistics that indicate what percentage of active fire risk assessors have become members of the registration organisations. A supporter of one particular registration organisation claims that the number of fire risk assessors who are members of a registration organisation is actually very small and has carried out a (unscientific) survey by typing the phrase *fire risk assessor* into an internet search engine: ‘If you go on the internet and just type in *fire risk assessors*, then click on all their sites to see how many of them actually quote that they’re on a risk assessor’s register, you’ll find it’s probably about ten percent’[171].

Fire safety audits and the role of the regulator

Fire safety audits are the only proactive mechanism for checking compliance of UK post-construction fire safety regulations: most premises are not normally subject to such audits. The logic of this approach is that fires in buildings are a rare occurrence and so the regulators turn their attention and target their resources on the premises where they calculate people are more at risk.

Each fire and rescue authority has responsibility for enforcing the fire safety regulations in their geographical area. This means that they have to provide sufficient resources such as fire safety enforcement officers, a system of management, training, premises, transport, and so on, to administer the regulations. An Enforcement Policy has to be provided that interprets and determines the authority’s approach to enforcement. The Chief Fire Officer’s Association (CFOA) provides the essential guidance, attempting to ensure that enforcement is correct and consistent with the wishes of Government,

[171] Interview with a fire risk assessor: No. 13: Jan 2015.

notwithstanding that the statutory responsibility resides with the fire and rescue authorities.

CFOA also administer the National Enforcement Register on behalf of the fire and rescue authorities in England and Wales. The Enforcement Register fulfils the requirement for fire and rescue authorities to publicly display the details of any fire safety enforcement action they take. It actually consists of three registers: (1) the Enforcement Register - giving details of Enforcement, Prohibition and Alteration Notices served; (2) the Prosecution Register - giving details of any prosecutions taken; (3) the Petroleum and Explosives Register - which is still under development and enforcement of petroleum and explosives is not a commitment shared by all fire and rescue authorities in England and Wales.

Analysis of the Enforcement Register suggests that fire and rescue authorities (in England and Wales) tend not to look closely at the quality of fire safety management in the companies they visit. For example, Article 9, the regulation providing for a fire risk assessment, is mentioned as being inadequate far more in enforcement notices than is Article 11, the regulation that provides for effective fire safety arrangements for management in the premises (see Figure 9 on the next page)[172]. This is curious because the two regulations are unavoidably linked. For example, a fire risk assessment is needed to identify the hazards, determine the risk, and recommend risk control measures for the management system to apply. A management system is needed to organise the satisfactory application of the risk control measures and to determine when the situation has altered sufficiently to require a review of the fire risk assessment. Thus, without a satisfactory management system, the risk control measures recommended by the fire risk assessment may not

[172]Source: http://www.cfoa.org.uk/11823 (accessed on 15 Dec 2018).

be applied satisfactorily and the review of those risk control measures may not be carried out. The expectation is that if the regulation requiring a fire risk assessment is cited then the regulation requiring satisfactory fire safety arrangement would also be cited.

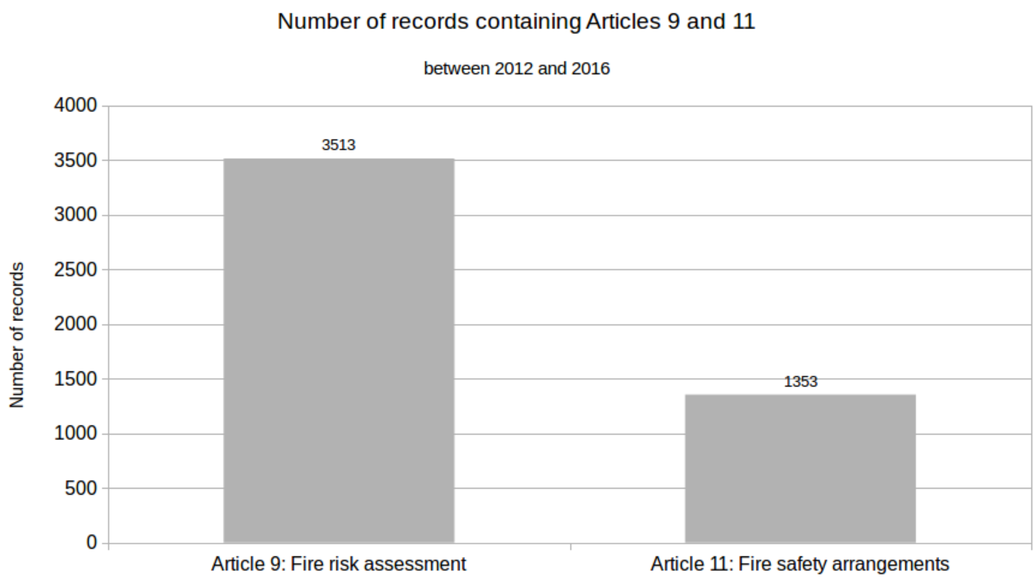

Figure 9 – Number of records between 2012 and 2016 in the Enforcement Register that contain Article 9 and Article 11 (England and Wales only)(Data taken from CFOA Enforcement Register)

The standard of the fire risk assessment is important because 'a fire risk assessment is designed to minimise the probability of the event of a fire by identifying the potential hazards and fire risks within a building'[173]. However, some fire risk assessors blame the regulator for the poor quality of fire risk assessments because of the lack of sufficiently firm action to remedy the low standard. As one fire risk assessor put it: 'The only people who are going to bring up the fire risk assessment to a reasonable standard is the fire and rescue authorities. They should target the bad fire risk assessors and prosecute them'[174]. Although uncommon, one instance of such a prosecution was seen

[173]Source: https://www.fia.uk.com/news/blogs/why-do-we-need-fire-risk-assessments-.html (accessed on 15 Dec 2018)
[174]Interview with a fire risk assessor: No.17: Jan 2015.

in the case of a fire risk assessor who was found guilty in February 2017 of failing to carry out suitable and sufficient fire risk assessments. Following two serious fires, South Wales Fire and Rescue Authority took the decision to visit over thirty different premises where the same fire risk assessor had carried out fire risk assessments. The fire risk assessor pleaded guilty to thirteen separate offences when faced with the overwhelming evidence. He was given a custodial sentence of six months, suspended for two years, and 180 hours of unpaid community work. The regulator advised all businesses they would need to review their fire risk assessment if it had been carried out by the convicted fire risk assessor[175].

However, some worry that such capacity for regulatory action is a wasting asset in a context where fire service oversight is less than it used to be. The fire safety enforcement officers who were trained to enforce the previous now superseded regulations were necessarily trained to a high degree of expertise to enable them to carry out their regulatory responsibilities. An essential characteristic of the enforcement role was that regulations were enforced by officers who had previously been, and often still were, operational firefighters. This was considered to be the basic requirement of officers who underwent further specialised training to carry out the role of a fire safety enforcement officer. The different approach of current regulations appears to have undermined this characteristic resulting in the replacement of those officers, as they retire, with officers who have both less operational experience and less training[176].

Some former fire safety enforcement officers think that the new cohort of fire safety enforcement officers lack the confidence that comes with experience. The lack of confidence results in their 'not applying the regulations in a rational

[175] For more information, please see: https://www.bafe.org.uk/fire-risk-assessor-pleads-guilty-to-13-charges-following-significant-assessment-failings/ (accessed on 15 Dec 2018).

[176] Interview with a fire risk assessor: No.7: 25 Nov 2014.

manner because they don't have the experience, the skills, or the knowledge necessary. They are almost reverting to previous prescriptive regulation and using prescriptive codes where they will fit rather than looking for risk-based solutions'[177]. Looking for answers using prescriptive codes is a satisfactory approach for buildings built to prescriptive codes which probably form the majority of buildings subject to current enforcement activity. However, this strategy may increasingly become troublesome as more buildings approved on the basis of performance-based designs become the focus of enforcement.

In addition to the concerns about the capacity of fire enforcement officers to carry out effective audits (especially as more buildings are approved with the use of performance-based design fire safety solutions), there is also concern that enforcement is not consistent across the UK. Certainly, the anlaysis presented in the previous chapter shows that there is evidence to that effect documented in the Enforcement Register, applicable in England and Wales. It would appear that where your business is located geographically has a bearing on how your fire safety regulations are enforced. Figure 10 shows the enforcement activity of the 47 fire and rescue authorities in England and Wales in terms of how many enforcement notices have been issued in the period between 2012 and 2016[178]. The chart shows the percentage of each fire and rescue authority's contribution to the total number of enforcement notices issued during the five-year period. There are clear differences in the number of enforcement notices issued by each fire and rescue authority but this is not a fair comparison because there are also differences between the make-up of each fire and rescue authority. To achieve a fairer comparison, each authority

[177] Interview with a fire risk assessor: No.10: 18 Dec 2014.

[178] Note: Data for Dorset and Wiltshire Fire and Rescue Authority may look anomalous because the authority is a new authority. It was formed in April 2016 when two previous fire and rescue authorities merged.

needs to have similar demographics such as a similar balance of urban and rural areas. The unfairness becomes apparent if one compares the West Midlands Fire and Rescue Authority, delivering a service to almost 3 million people in a largely built-up metropolitan area, with Cumbria Fire and Rescue Authority, delivering a service to about half a million people in a much larger rural area. However, even with this difference in mind, it is then striking to note in Figure 10 that both West Midlands and Cumbria issued a similar number of enforcement notices between 2012 and 2016.

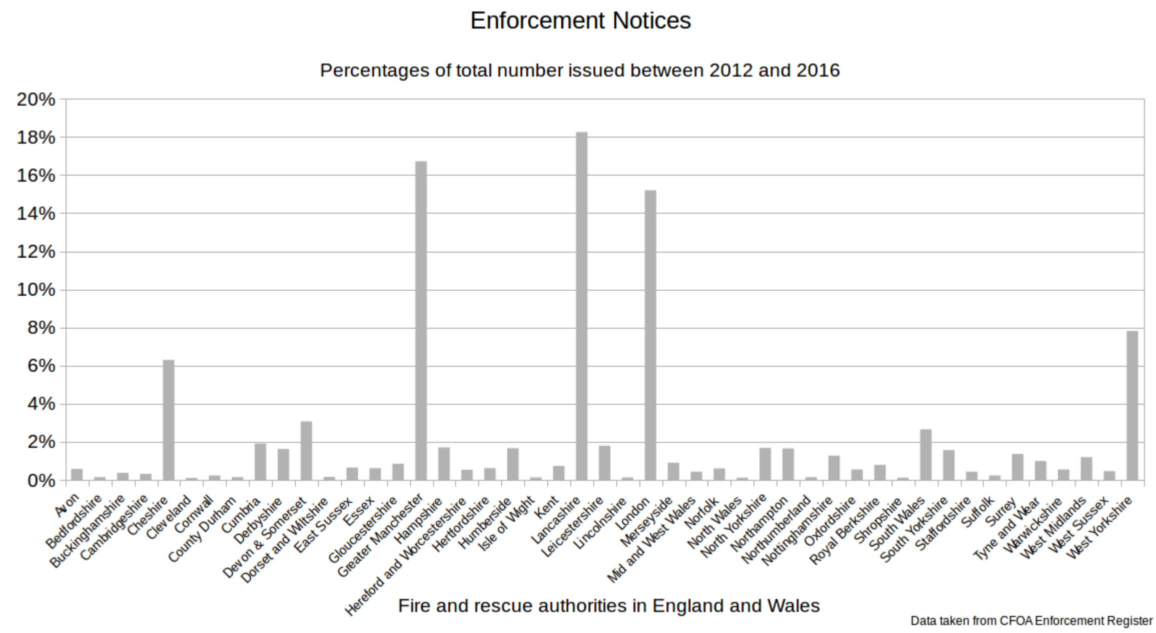

Figure 10 – Chart showing the percentage of Enforcement Notices issued in England and Wales between 2012 and 2016

The Government pondered the lack of ability to compare one fire and rescue authority against another when the concept of performance management was introduced in the 1990s; the solution was to introduce the Family Group series. The existence of the Family Group series makes comparison between fire and rescue authorities less nonsensical[179].

[179]More information about the Family Groups can be found on page 156 in Chapter 6.

The expectation for each Family Group in respect of enforcement activity would be that the members of the Group would record similar performances, but data from the Enforcement Register indicates that this is not the case. It is easy to pick out the anomalies when looking at Figure 11. Lancashire Fire and Rescue Authority has recorded more enforcement activity than the other thirteen Family Group 4 fire and rescue authorities during the five-year period. If the mean value for the issue of enforcement notices between 2012 and 2016 in Family Group 4 is about 7%, then twelve fire and rescue authorities are below that value and two are above that value. At about seven times above the average, the value for Lancashire Fire and Rescue Authority is clearly an outlier.

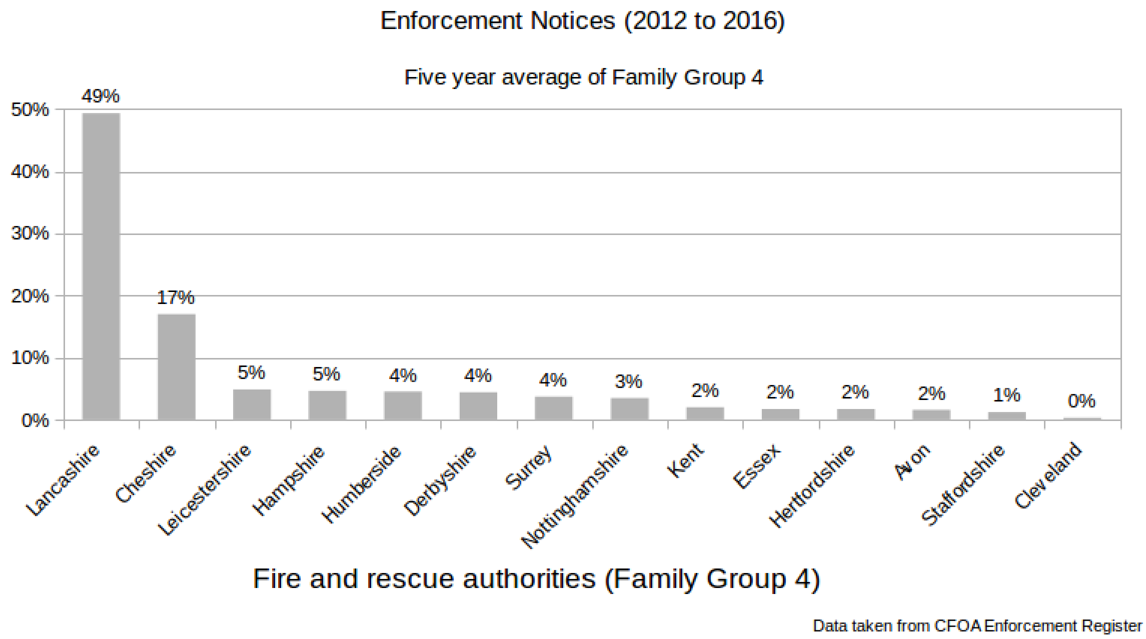

Figure 11 – Chart showing the percentage of Enforcement Notices issued in Family Group 4 between 2012 and 2016

While the inconsistency of enforcement may not amount to regulatory capture in itself, it highlights concerns that the fire and rescue authorities are losing capacity to provide effective oversight. In particular, a lack of effective oversight by the regulatory authorities could provide the conditions for regulatory capture because it means that post-construction regulation of fire safety necessarily relies heavily on the success of the self-regulatory mechanism of duty holders. There may be differences between each fire and rescue authority in terms of their geographical areas, and sparsity of their populations but, with regard to the regulation of fire safety in a factory, shop, hotel, or boarding house, the risk should not differ wherever the business may be. In addition, there are no apparent reasons why businesses in one part of the UK should be better, or worse, at self-regulation of fire safety than any other part of the UK. Does the data show that some fire and rescue authorities have a stricter, or leaner, enforcement policy than others? Is there a need to establish the criteria to benchmark the correct amount of enforcement?

Feedback in the design of buildings

In the course of this thesis research an issue emerged that had not originally been considered. An initial focus was on the transfer of fire safety information from the design to the occupation phase of a building, and the implications of this process for carrying out suitable and sufficient fire risk assessments. However, as the fieldwork progressed it became clear that the reverse process – of knowledge transfer from occupation back to designers – might also be significant. This process is important in improving performance in many technologies. Indeed, in some, such as software, it is an essential element in making the software user-friendly and reliable.

It is also an important element in the regulation of other technologies, for example, that of new medicines in the pharmaceutical industry. In the pharmaceutical industry, reporting of adverse events in connection with medicines or medical equipment is of great significance in monitoring safety. Pharmacovigilance, the ‘science and activities relating to the detection, assessment, understanding and prevention of adverse effects or any other drug-related problem’[180] encourages the reporting of any anomalous or unexpected event. Reporting adverse events is a shared responsibility between the pharmaceutical companies, the regulator and the healthcare professional. The company has a responsibility for monitoring the safety of their product; the regulator has a responsibility for the use of the medicine within the terms of the marketing authorisation; and the healthcare professional is expected to report adverse events observed during use of the medicine. Even members of the public are encouraged to use the reporting system. The strategy used in the UK since 1964 is the Yellow Card Scheme which involves the completion of a short form that can be mailed or completed online. Mann and Andrews (2007, p.8) maintain that the Yellow Card Scheme is invaluable and it is ‘essential that health professionals should be provided with the means of reporting their suspicions’.

The Federal Aviation Administration also see adverse event reporting as an important element of feedback in the aviation industry. The FAA has set up a number of partnership programmes with the aim of assisting the regulation of aviation and improving safety in the industry. The programmes are aimed at encouraging people to report what they see as adverse safety events or concerns anywhere in the aviation industry or transport system. Some of the schemes promise limited immunity in return for taking the trouble to report adverse events. The Aviation Safety Reporting Program (ASRP) was set up in 1975 to allow any user to make a report on any adverse event affecting safety. The Voluntary Disclosure Reporting Program (VDRP) and the Aviation

[180]The definition is one given by the World Health Organisation, available at https://www.who.int/medicines/areas/quality_safety/safety_efficacy/pharmvigi/en/ (accessed on 15 Dec 2018).

Safety Action Program (ASAP) were set up in 1990 and 1997, respectively, to encourage employees in aviation and subsidiary industries to self-report safety incidents to the regulator. The Flight Operational Assurance (FOQA) was set up in 1995 to encourage air carriers to share their flight data for analysis with the regulator (USGAO, 2004).

User feedback in building design is as important as the user feedback in any other technology because it can be used to refine the fire safety design of a building. Without the building user feeding back information about the suitability and performance of the design the knowledge will be lost and design faults will be endlessly repeated. There is no existing regulatory mechanism for feedback similar to the schemes in the pharmaceutical and aviation industries as described above, but feedback does exist and it is having an impact. One example of feedback informing building design can be found in buildings that include a day nursery or crèche. In such a building, the fire safety design usually facilitates the day nursery or crèche facility being situated on the ground floor with a door that opens directly to open air and the safety of being outside the building. The motivation for this convention originates from the *Summerland Leisure Centre* fire in Douglas, Isle of Man, where the inquiry into the fire in August 1973 found that parents had tended to be separated from their children while they spent time elsewhere in the Centre. When they became aware a fire had occurred (the inquiry found that the fire alarm was never sounded), parents refused to evacuate themselves without their children. Instead of going directly to the fire exits as was expected, parents naturally tried to find and collect their children. The Inquiry recommended that '[i]n order to minimise the risk ... the accommodation for children should be at or as near ground level as practicable ... the room or enclosure for children should be adjacent to an external wall and should have not fewer than 2 exits, one of which should be a final exit' (HMSO, 1990, pp.39-40).

There was a reminder of the importance of this particular feedback in respect of nurseries when a fire occurred in the Villagio shopping mall in Doha, Qatar in 2012. The shopping mall included a nursery on the first floor but the children and staff became trapped when the fire occurred. Initially, firefighters did not realise the existence of the first floor nursery and the possibility that it could still be occupied. Two firefighters came across the nursery as they were searching the building but found themselves with few options. When other firefighters became aware of the nursery and made efforts to reach it, they found the bodies of 13 children, four nursery staff, and the two firefighters. Abdul Khaleq al-Huwari, one of the fire fighters, is quoted as saying that ‘the nursery is difficult to find and it has no emergency exits’[181].

The Doha nursery is a sad example of buildings being designed and used without incorporating the feedback gleaned from former incidents. The Summerland fire is a notorious incident throughout the fire industry with many learning points and it is surprising that this particular learning point was not heeded in the design of the Doha shopping mall. Sadly, it is not uncommon for building designers to be oblivious of the criticism or praise of users of their building designs, as they do not normally solicit it. Though it seems quite common to see an article in a local newspaper praising the efforts of the building designers of a new leisure centre or civic building, with the building very often described as award-winning, there is little information of how it achieved that label. The winning of such an award has little to do with the views and opinions of the building user as there is no obvious method of soliciting those views and opinions.

[181] Source: http://www.smh.com.au/world/firefighters-tell-of-doha-mall-horror-20120530-1zjmc#ixzz1wQtWZpHA (accessed on 15 Dec 2018).

The fire safety audit, however, seems well-placed to become a mechanism for collecting knowledge that could be used to feedback knowledge to building designers about how building designs are being used or abused. Such a mechanism has the potential to refine the design of buildings with data about how the users are coping with the fire safety design and, hence, the fire-safe environment. However, the knowledge collected during a fire safety audit is not analysed with a view to collecting data that could be used in this way. Its chief purpose is to collect data in a satisfactory and consistent way that assists in enforcing the regulations and which can be used as evidence if a prosecution is considered.

It is odd that more feedback is not encouraged either via social media or any other method but if there was more feedback, there is the question of how it should be handled. Because fires are rare, fire safety design is seen as an unwelcome but necessary expense for most buildings, rather than a central element of the overall design. It is a compromise determined by solving the problems of the building design and by satisfying the pre-construction regulator. So, injecting the critical evaluation of the building user to influence the design could increase the workload and cause resentment amongst the building designers. Yet, feedback from the building user could be valuable if it allows a building designer to understand what parts of the design are beneficial to the user and what parts are not. It can offer a number of advantages; it can provide data to assist in improving future building design, it can validate and refine the building user profiles used in building design, it can make buildings more productive and better suited to their purpose. Instead, what currently happens is that the building designer forms an opinion based on a judgement of how the building will be used and who will use it, and this script is black-boxed into the fire safety design. Their judgement is informed by guidance based on logic, supposition, and assumption but with little empirical data about the user experience. The effect of this is 'that the building user is forced to make the building operate around the way that it has been designed'[182].

Consider, for example, the abuse of the self-closing fire-resisting doors that are a critical component of the fire safety design on the majority of building designs. There is little evidence that anything is being done about the abuse that has been a common element of fire safety enforcement for the past fifty or sixty years. The situation is so bad that fire safety enforcement officers expect to see self-closing fire-resisting doors being abused in every inspection they carry out. Why is this still happening after such a long period of building design?

To some, a feedback loop is non-existent: 'I don't see any feedback loop because the fire safety failures are too consistent'[183]. Is a feedback loop a feasible proposition? For example, is it feasible for there to be a feedback loop from fire safety enforcement officers enforcing fire safety in occupied buildings to the building designers deliberating over the plans for new buildings? There is a common link between the design of buildings and the occupation of buildings because the fire and rescue authorities are involved at both ends of the building construction process. During the pre-construction building design stage, the fire and rescue authorities are consulted by the pre-construction regulator. They have a statutory right to be consulted with regard to building plans and they can recommend plan alterations based on their own interpretation of the available guidance. The final arbiter is the pre-construction regulator who can accept or reject any recommendations. The fire and rescue authorities are also involved when a building is occupied and operating, as they are the post-

[182] Interview with a fire risk assessor: No.23: 11 May 2015.
[183] Interview with a fire risk assessor: No.10: Dec 2014.

construction regulator for the majority of premises. They regularly carry out fire safety audits and they also investigate the cause of fires, providing evidence for the police authorities to prosecute the crime of arson. Thus fire and rescue authorities have the foundational components to create a formalised system of feeding back information about fire safety failures to inform building design.

All fires attended by the fire and rescue service are investigated and the cause is recorded. The minority of fires, those that become major incidents or result in a large loss of life, attract a more formal investigation, usually by a specialist officer. The findings from these investigations are usually collected and published for the convenience of other agencies. Some investigations achieve notoriety because they have received national political attention. Examples include: Lakanal House; London in 2009; Buncefield Petroleum storage depot, Hertfordshire, in 2005; the fire at King's Cross Underground Station, London in 1987; the fire involving the Stardust Disco, Dublin in 1981; the fire at the Summerland holiday centre, Douglas, Isle of Man in 1973; and so on.

Some fire consultancies run training courses focusing on the findings from this type of incident because of the lessons that can be learnt and used to inform the design process[184]. Some of them have developed their businesses to participate in both the pre- and post-construction environment, creating opportunities by which building designers can be informed with building user experience. This is because they employ both fire safety engineers and fire risk assessors, offering services of fire safety design in the pre-construction environment and fire risk assessment in the post-construction environment. Fire consultancies that have developed this type of business model have created an opportunity for fire safety engineers participating in building design teams to be informed by the findings reported by the fire risk assessors. The potential

[184] Interview with a fire safety consultant: No.12: Jan 2015.

exists, in such consultancies, for fire safety engineers to produce fire safety designs that are less likely to produce the circumstances that could develop into the common faults normally encountered in the fire risk assessments carried out by their fire risk assessor colleagues[185].

The findings from formal fire investigations occasionally have a lasting effect on building design. The 2004 Rosepark care home fire in Scotland had the effect of changing the fire safety design guidelines published by the Scottish Government which now requires all new care homes constructed in Scotland to be fitted with a sprinkler system. The result is that Scottish building standards now differ from building regulations in England and Wales in this regard. Different requirements now apply in the two jurisdictions in respect of the design of a care home. In Scotland, the installation of a sprinkler system in the design for a new care home is a requirement. In England and Wales, the installation of a sprinkler system is not a requirement but, if one is fitted, it allows the building designer certain design freedoms. The design freedoms include the ability to remove the need for self-closers on bedroom doors, and the option of increasing the number of residents allowed in each sub-compartment. Equally cognisant of the findings of the Fatal Accident Inquiry into the fatalities at Rosepark care home as the Scottish Government, the UK Government has chosen not to follow suit in England and Wales. Therefore, in respect of the design of new care homes, an imbalance now exists between England and Wales, and Scotland brought about by different responses to feedback generated following the investigation into a fire[186].

Another ad hoc feedback system exists in the specialised set of circumstances relating to a multi-occupied building such as an airport terminal or a

[185]Interview with a fire safety consultant: No.12: Jan 2015.
[186] Interview with a fire safety consultant: No. 23: Feb 2015.

shopping mall. This type of premises, a large concern with much investment, is likely to employ specialists to assist with the management of the building. One of the specialists is likely to be a fire safety adviser to help formulate policy in the management and coordination of fire safety involving all of the different tenants. There is much to do in such premises, in respect of the correct operation of the fire safety design, if you consider the extensive nature of shopping malls such as Meadowhall near Sheffield, or Merry Hill near Dudley, and multi-franchised airport terminals such as Birmingham and Manchester airports, or Terminal Five at Heathrow. Alterations and modifications to the premises, fire safety alerts and inspections, security exercises, and so on, are daily occurrences in such premises affording a fire safety adviser much insight into the workings of the fire safety design.

When a building alteration is proposed, at one UK airport terminal, the fire safety adviser is brought into the discussions as soon as they begin and is able to contribute fire safety advice at a very early stage. His experience of the operation of the fire safety design is invaluable at this stage of a building alteration. His role can be likened to that of championing the cause of the building user from the credible position of offering an informed opinion of whether the planned alteration will work as postulated or not. This type of knowledge on hand to inform the process of building design can be used to offset known fire safety problems, ensuring the design is compatible with the fire safety design for the rest of the premises: ‘This is critical to the running of the airport because the design won’t work if it can’t be operated how we want to operate it’[187].

[187] Interview with a fire safety adviser: No. 8: Nov 2014.

Summary

This chapter has presented the findings of the study and examined them in the light of the theoretical framework presented in Chapter 2. Evidence mostly taken from interviews with actors active in the field of fire safety has been used to clarify and untangle the interpretation and meanings behind the research questions, offering the reader the opportunity to form her own opinion. The next chapter is the researcher's opportunity to conclude the findings of the research and to offer his own opinion.

Conclusions

Findings

This thesis provides the first detailed description and analysis of UK post-construction fire safety regulation, drawing on interviews, quantitative data, and documentary analysis. The data thus collected and analysed suggests that UK post-construction fire safety regulation is incoherent and inconsistent in a number of significant ways. The regulatory authorities (the fire and rescue authorities for the majority of premises) provide oversight that appears to vary between different regions, and the value of this oversight is heavily dependent on the choices of individual authorities and how they decide which premises to investigate. Using a risk-based methodology to make the choices means that for many premises the only fire safety regulation that occurs during a building's lifetime now consists of self-regulation using the mechanism of the fire risk assessment. However, the findings of the thesis highlight concern about the degree to which fire risk assessments can be considered adequate in cases where the assessor's competence is in doubt because of unfamiliarity with the principles embodied in a building's original fire safety design.

There are a number of reasons to question the effectiveness of self-regulation, as discussed in Chapter 7. In particular, three issues that influence that effectiveness have been addressed in this analysis: (1) the way in which the *black-boxing* of fire safety design impacts the quality of fire safety self-regulation; (2) the importance of *expertise* and its distribution amongst relevant actors; and (3) the degree to which self-regulation of UK post-construction fire safety is compromised by a form of *regulatory capture*.

Post-construction self-regulation is compromised by regulatory capture in three main ways: (1) most building occupiers need not prioritise fire safety because there is only a limited amount of regulatory oversight. Even well-intentioned businesses may become complacent about the risk of fire when faced by more immediate day-to-day concerns, whereas the more unscrupulous may ignore some of the very basic tenets of fire safety, such as, maintaining access to fire exits; (2) the competence of most actors is not formally regulated by Government and is dependent on self-policing by the fire safety industry itself; (3) the enforcement procedure encourages the fire safety enforcement officer to ignore the fire safety information provided for the duty holder in the pre-construction design stage in favour of creating new knowledge generated in the responses to the fire safety audit.

These aspects of UK post-construction fire safety regulation have not been previously analysed but the June 2017 Grenfell Tower fire (which occurred as this thesis was being finalised) highlights the importance of detailed scrutiny of all aspects of fire safety. This thesis thus points to areas that need to be addressed by the prevalent actors in post-construction regulation of fire safety and indicate where future research should lie.

In particular, this research shows how the black-boxed nature of some aspects of fire safety designs can hinder the maintenance and management of post-construction fire safety. There is no proper monitoring of the transfer or utilisation of fire safety information, the process is regulated but only by an affirmation that something has been done. There is no attempt to regulate what has been done, how it has been done, or whether the process achieved its aim. The process also pre-supposes a level of competence on the part of the duty holder that is only likely to be met in premises where the occupying company is large enough to employ a specialist.

However, while there is a need for greater expertise amongst actors, the deregulatory policies pursued by the UK Government means that much of the onus for ensuring this expertise rests with industry. Not only is the standard of expertise for a fire risk assessor a matter of self-regulation, but also the enforcement policy of the fire and rescue authorities concentrates resources on certain types of premises resulting in a form of regulatory capture within the industry. Individual duty holders in the majority of premises police themselves and, consequently, have the option of satisfying (or not) the regulations in whatever way they choose. Some make much effort to satisfy them correctly but because of confused perceptions about the regulatory responsibilities and the competence needed to carry them out, find themselves at the mercy of those offering their services to do so on their behalf. Others take advantage of their situation to make little effort and carry out their regulatory responsibilities in a perfunctory manner.

The particular contribution of this thesis is that is provides the first comprehensive documentation and analysis of these failings in UK post-construction regulation, drawing on an unprecedented level of access to practitioners. This is an important contribution because, until June 2017, fire risks have had low salience because of the relatively low, and generally reducing, number of deaths in recent years. The two main measures of the performance of post-construction regulation are: (1) the number of fire injuries in premises other than single-family dwellings; and (2) the level of enforcement activity. The number of fire injuries is associated with the number of property fires. However, because fire is a relatively rare phenomenon, this measure gives little indication of the number of premises where fire injuries could potentially occur.

Another concern is that the risk is changing because of the increasing occurrence of buildings built to performance-based design. Prescriptive building design, to a certain extent, follows explicit rules that a duty holder can usually surmise (although without the building design information such assumptions can be mistaken). But because of its newness and the multiplicity of possible designs, performance-based design is much less predictable and therefore in need of a greater expertise amongst the relevant actors. This leads to more doubt about the adequacy of the self-regulation of post-construction fire safety.

As the Grenfell Tower fire shows, it is unwise to rely on historical statistical data alone because fire safety failures which occasionally result in high numbers of deaths may only be revealed by a particular chain of events. For a fire to ignite, grow, and develop out of control takes a number of factors to coincide in a particular way; for that fire to then cause a large number of casualties then requires even more unlikely combinations of factors. Most fire safety failings do not lead to fires and, if they do, they do not lead to significant injuries. However, if we only address fire risks according to historical data on injuries then we run the risk of complacency that can lead to rare, but disastrous events; in particular the historical record may be invalidated by innovation in design and construction methods, and in the way that regulation is carried out.

Recommendations

Research question 1: Black-boxing of fire safety knowledge

Black-boxing of fire safety knowledge by the pre-construction building design team is inevitable but it must provide for the maintenance of the fire safety environment envisaged in the building design. In England and Wales the process of knowledge transfer is a linear communication model with a method for monitoring that the regulation has been carried out but which does not ensure that the information reaches its intended recipient in a useful form.

In Scotland, the process is also a linear communication model with a similar method for monitoring that the regulation has been carried out but with the difference that the fire safety information is ultimately lodged with the local authority and thus becomes a public document. This enhancement, if adopted in England and Wales, would be complicated because of the existence of the Building (Approved Inspectors etc.) Regulations (2010). In this legal framework, the advancement of business aims means that information passed between regulator and client is considered confidential in nature. Moreover, the creation of approved inspectors was the Government's attempt to create a competitive environment providing an alternative option for building developers to local authority supervision of building control. Thus lodging the fire safety information with the local authority would be problematic because it would break confidentiality between an approved inspector and client and would require collaboration between two competitors. While the collaboration aspect could be overcome by an agreed protocol, the confidentiality aspect hits at the core of the relationship between the business and the client. The fire safety information would have to be scrutinised by the approved inspector and client for the potential of giving competitive advantage to a rival business. This would counteract the focus of the regulatory requirement and could undermine the information intended to 'assist the eventual owner/occupier/employer to meet their statutory duties under the Regulatory Reform (Fire Safety) Order' (Approved Document B, 2010, s.0.12, p.9).

While the regulations in both jurisdictions provide guidance on the content of the fire safety information (in England and Wales, the prompt is a list of contents, and in Scotland, a document template) no regulator monitors the quality or relevance of the content. There is no check to make sure the information is complete, unambiguous, or legible to a wide range of potential recipients from a diverse range of backgrounds. There is also no check to make sure the document reaches its intended recipient.

Monitoring the content and quality of the fire safety information could form part of the regulation, as could the monitoring of whether the information has been received by the intended target. The mechanism of monitoring is the easy part, the more difficult part is to determine and control the quality of authoring needed so that the information can be easily assimilated and comprehended by non-experts in fire safety. Mention of the fire safety information also needs to be made in the post-construction fire safety regulations to alert the duty holder to the existence of the information or to question its absence.

More assistance should be given to the duty holders to assist them in assimilating, utilising, and incorporating the fire safety information into their management systems. Trade associations and fire and rescue authorities already give advice to their respective communities but the advice must be more specific towards a more effective utilisation of the fire safety information.

Research question 2: Distribution of expertise

The distribution of expertise in the current post-construction regulatory regime has altered from the previous regulatory regime as a result of pressure from key groups of actors in the fire industry plus the political desires of Government. This has caused a crisis in the fire safety industry because the distribution of expertise in the previous regime is mismatched with the new regime as well as being ill-defined. One of the crisis points has been caused by the convergence of three influential components: (1) the popularity of performance-based design of buildings to sit alongside buildings designed to traditional prescriptive building codes; (2) the change in responsibilities with regard to post-construction regulation of fire safety; and (3) the determination of the level of competence and expertise needed by duty holders, and those who act on their behalf, to self-regulate.

It probably means little to the majority of duty holders whether the premises for which they are responsible has been constructed to a prescriptive building code or a performance-based design. However, it is significant if they are to carry out their responsibilities correctly. Specifically, if they employ an external specialist to carry out the fire risk assessment, they need to furnish her with the information she requires to fulfil her contract successfully. They also need to incorporate the operation and maintenance of the fire safety installations, along with the findings of the fire risk assessment, into their fire safety management system. For both of these actions, the duty holder needs to be aware of the differences between the different building designs to be able to manage them as they are intended to be managed.

By no means unrelated to the above is the issue of the competence of duty holders to self-regulate. It seems pointless to claim, as the regulation enforcers do, that the duty holder can delegate the task of fire risk assessment or the management of fire safety, if the duty holder has little idea of what she is delegating. Typically, the duty holder requests the assistance of a specialist contractor because she feels that she lacks the competence to carry out the necessary tasks herself. This raises the question of how she knows, when told the tasks have been completed, if the tasks have been carried out competently or not? Thus, there is a certain level of competence needed on the part of the duty holder to be able to make the decisions and determinations that have to be made.

The obvious resources to assist in both raising awareness and increasing the level of competence of the duty holders lie with the Government, the fire and rescue authorities, and trade associations. The Government, in particular, needs to assess the suitability of a scheme to better ensure the competence of actors involved with self-regulation, perhaps a scheme similar to the GasSafe Register. Such a scheme could set credible qualifying standards for fire risk assessors allowing the Government to monitor that only qualified practitioners could carry out fire risk assessments. The fire and rescue authorities and trade associations could lend their support and resources to such an endeavour.

Research question 3: Regulatory capture

The current post-construction fire safety regulations are mostly self-regulated by the duty holder of a premises. This amounts to a form of regulatory capture because the regulated individual or company in the majority of regulated premises has full control over how the regulations are applied. There is little research into the effect of this and therefore little comprehension of what is happening and what its consequences might be?

The regulators (mostly the fire and rescue authorities), using their enforcement mechanism of the fire safety audit, visit mostly those premises that they consider offer the highest risk to life from a potential fire. It is generally known that those premises include the ones that offer sleeping arrangements: hotels, hostels, boarding houses, hospitals, and so on. However, currently the number of resources available to the fire and rescue authorities is said to be in decline[188] and so it might be assumed that the impact they usually make may also be in decline. The declining impact largely affects other types of premises, those considered to offer low or medium risk to life from a potential fire. These premises are visited and inspected but this typically only happens when an opportunity arises. Opportunities arise when someone has made a

[188]The number of fire officers employed by fire and rescue authorities as specialist fire safety enforcement officers is in decline (source: https://www.theguardian.com/uk-news/2017/aug/29/englands-fire-services-suffer-25-cut-to-safety-officers-numbers (accessed on 15 Dec 2018).

complaint in connection with the fire safety in a premises, or when a firefighting crew, whilst dealing with a fire incident, has observed a situation that looks like a regulatory breach, or when an officer from a partner agency has observed what looks like a regulatory breach whilst making their own visit to a premises, and so on.

Increasing our understanding about the effect of this form of regulatory capture means satisfying the need to investigate the behaviour of the duty holders and their general level of competence and expertise to discover what is going on. Data built up through research into this area could be analysed to find any trends that appear to support and enhance, or adversely affect, the safe environment in premises. A database of best practice held centrally and shared amongst duty holders, by the fire and rescue authorities and trade associations, might eventually lead to a community of duty holders sharing best practice amongst themselves. Given the willingness of key actors, this type of activity could lead to a change in the culture surrounding the enforcement of post-construction fire safety regulation.

One target should be a partnership between the regulators and the self-regulated to repair the present dysfunctional process of knowledge transfer. The duty holder is expected to use the fire safety information provided by the pre-construction building regulations to assist with regulatory responsibilities. This is desirable because the fire safety information is important having been authored by the building designer attempting to maintain the designed safe environment. However, the fire safety information is not considered sufficiently important to feature either in the post-construction regulations or the guidelines that direct the conduct of fire safety audits. Thus the intention of the pre-construction regulations in encouraging the duty holder to use the provided fire safety information to manage fire safety in the premises is very often lost.

This loss is then compounded because the fire safety enforcement officer is not prompted to compare her findings against any attempt by the duty holder to utilise and develop the provided fire safety information. Instead the fire safety enforcement officer is encouraged to create new knowledge based on her interpretation of the regulations. It is this new knowledge that the duty holder is judged against.

A more coherent system would be one where both the duty holder and the fire safety enforcement officer value the importance of, and employ, the same fire safety information. One benefit for the duty holder is that she would be able to use it to demonstrate her diligence in managing fire safety in the premises. One benefit for the fire and rescue authorities is that it could be the logical starting point for the fire safety audit.

Feedback in building design

Building designs contain the assumptions made by building designers about how buildings will be occupied. These *scripts* of user behaviour, along with regulatory requirements, influence the choice of location and size of rooms, the position of stairs, partitions, doors, the range and scope of fire protection installations and fire equipment, and so on. The designer's vision is tempered by the process of negotiation with others in the building design team, and also by the need to satisfy the regulator but, fundamentally, the vision is based on the way that the building designer assumes the building will be occupied. However, there is little research into how these assumptions are formed or how the assumptions compare with the actual occupation of the building.

There are many examples where the failure of a building design has been put down to wrong assumptions made by the building designer. A well known example is the fire at Summerland, Douglas, Isle of Man in 1973 (described in Chapter 7), where the assumptions made about the behaviour of occupants were found to be erroneous when the fire occurred. The error in these specific assumptions were made explicit in Government guidance (HMSO (see 1990, pp.39-40)) but, generally, there is no formal mechanism where such errors are documented and fed back with the intention of improving building design. This becomes more obvious when considering a fire safety failure that has been repeatedly happening in the UK for many years. Evidence in this thesis suggests that fire safety enforcement officers witness the abuse of self-closing fire-resisting doors on most of their inspections and that there is even an expectation that they will do so, yet there appears to be no concerted effort to improve the situation. We are apparently content to tolerate the abuse by constantly castigating the building manager.

There appears to be little attempt, either formally or informally, to appeal to building designers to *engineer away* the problem by, for example, excluding fire doors in building design. This line of thought leads to an inevitable conundrum that can only be solved by dedicated research into the subject. It may be the case that the effect of abusing self-closing fire-resisting doors has little overall effect on the levels of safety in buildings, or it may be that the problem is so intractable that it is too difficult to solve and so is effectively ignored. However, analysis of the problem is certainly needed, and the first step into addressing this, and other potential fire safety failures, is to start collecting data so that research can be undertaken. If, in the case of self-closing fire-resisting doors, the problem is as widespread and influential as fire safety enforcement officers believe it to be, then the body of evidence collected may encourage building designers to consider and tackle the problem.

Take-home message

With regard to fire safety, the building that has been constructed is rarely tailored to suit the needs and desires of the building user. A building is designed by making assumptions about the building user, but there is a lack of relevant research or analysis into how the building user actually uses the building. If the user subverts the *script* then there is a risk that fire safety features will be undermined. There is also the lack of a *building user champion* in the building design team to fight the case for making the building suit the building user, rather than designing it to suit the building designer. But, even if there was a building user champion, it is difficult to see how this would alleviate the situation. It is highly unlikely that this person would have a specific interest or technical competence in building fire safety design.

Even after a building has been constructed and occupied, the expectation on the building user with regard to management and self-regulation seems rather unrealistic. She is expected to adhere to the fire safety design without the ability to ask the designer for clarification about any aspect of the fire safety design and usually without benefit of fire safety design information. She, as the duty holder, is expected to self-regulate the post-construction fire safety regulations in which she most probably has little expertise, competence, or comprehension. Then if, for example, there is a fire incident that raises the need to call for fire and rescue service assistance, she stands the chance of being audited on her self-regulatory performance. The audit will be carried out by a fire safety enforcement officer who can ignore the original fire safety information and, instead, generate new knowledge on which the duty holder will be judged.

Coda

The multiple fatalities in the fire in North Kensington, London on 14 June 2017 occurred as this thesis was being written. The fire, involving the multi-storey Grenfell Tower, represents the largest loss of life in a fire in the UK mainland in living memory[189], surpassing the major fires at King's Cross Underground Station in 1987 (31 deaths), Bradford City Football Club in 1985 (56 deaths), Summerland Holiday Resort in 1973 (53 deaths), or James Watt Street, Glasgow in 1968 (22 deaths). The full facts of what caused this disaster will take time to be established, but there can be little doubt that this fire constitutes a major failure of the regulatory system intended to provide adequate fire safety in the UK. Given that Grenfell Tower was a 43 year-old building that had recently undergone renovation and re-cladding, and regardless of the specific causes and mechanisms of fire ignition and growth, this tragic fire stands to reinforce the importance of the findings of this thesis that UK post-construction fire safety regulatory processes may be flawed either in their conception or operation, or perhaps both. It is clear from the interim and final reports of the Independent Review of Building Regulations and Fire Safety, set up under Dame Judith Hackitt following the Grenfell Tower fire, that many of the failings identified in this thesis are now likely to be addressed. That these failings were widely suspected in the industry, but generally unreported and unaddressed to date, highlights one of the key challenges for policy making on fire safety. This thesis provides the knowledge base necessary to address many of these failings.

[189]The final number of deaths associated with the fire at Grenfell Tower has been determined as 71 deaths (source:http://www.bbc.co.uk/news/uk-42008279 (accessed on 15 Dec 2018)).

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Appendix 1: Details of Interviewees

Ref	Applicable role(s)	Age (estimated)	Gender	Interview date
1	FSA/FSEO*[190]	50-60	M	Apr 2014
2	BCO	40-50	M	Aug 2014
3	BCO	40-50	M	Aug 2014
4	FRA/FSA/FSEO*	60-70	M	Nov 2014
5	FRA/FSA	40-50	M	Nov 2014
6	FSA/FSEO*	50-60	M	Nov 2014
7	FSA/FSEO*	50-60	M	Nov 2014
8	FRA/FSA	40-50	M	Nov 2014
9	FRA/FSM	30-40	F	Dec 2014
10	FRA/FSA/FSEO*	50-60	M	Dec 2014
11	FSA/FSEO	40-50	M	Dec 2014
12	BCO/FSA/FSE	40-50	M	Jan 2015
13	FRA/FSA/FSE	30-40	M	Jan 2015
14	FRA	20-30	M	Jan 2015
15	FRA/FSA/FSEO*	60-70	M	Jan 2015
16	FRA/FSA/FSEO*	40-50	M	Jan 2015
17	FRA/FSA/FSM	50-60	M	Jan 2015
18	FSE	40-50	M	Jan 2015
19	FRA/FSA	50-60	M	Jan 2015
20	FRA/FSA	50-60	M	Jan 2015
21	FRA/FSA/FSE/FSEO*	50-60	M	Jan 2015

[190]* An asterisk denotes that the interviewee was a former fire safety enforcement officer.

22	FSE	30-40	F	Feb 2015
23	FRA/FSA/FSE	60-70	M	Feb 2015
24	FSE	20-30	M	Apr 2015
25	BCO/FSA	50-60	M	Apr 2015
26	FRA/FSA/FSEO*	60-70	M	Apr 2015
27	FRA/FSA/FSEO*	50-60	M	May 2015
28	FSEO	50-60	M	Jun 2015
29	FSEO	40-50	M	Jun 2015
30	BCO	40-50	M	Jun 2015
31	FRA/FSEO*	50-60	M	Jun 2015
32	FSE	30-40	F	Jul 2015
33	FSEO	40-50	M	Jul 2015
34	FSA/FSE/FSEO*	60-70	M	Jul 2015
35	FSA/FSEO*	50-60	M	Apr 2016
36	FSL	30-40	M	Mar 2017

Table 2 – Key to acronyms

Title	Acronym
Building control officer	BCO
Fire risk assessor	FRA
Fire safety adviser	FSA
Fire safety engineer	FSE
Fire safety enforcement officer	FSEO
Fire safety manager	FSM
Fire safety lawyer	FSL

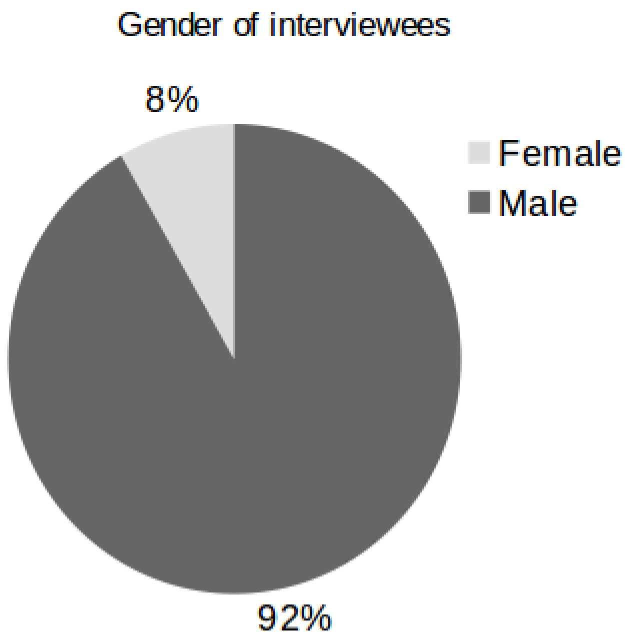

Figure 12 – Gender of Interviewees

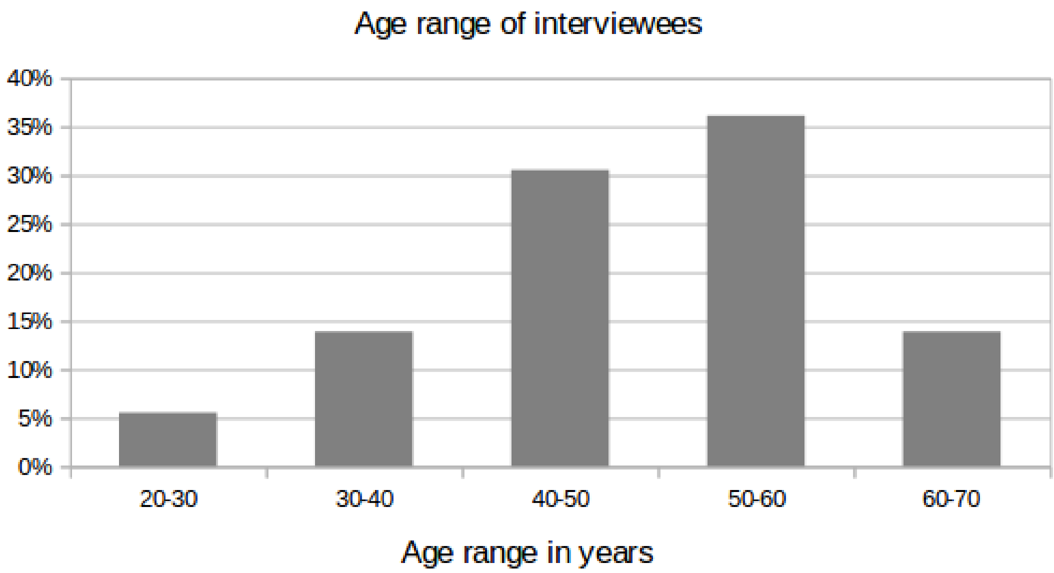

Figure 13 – Age range of Interviewees

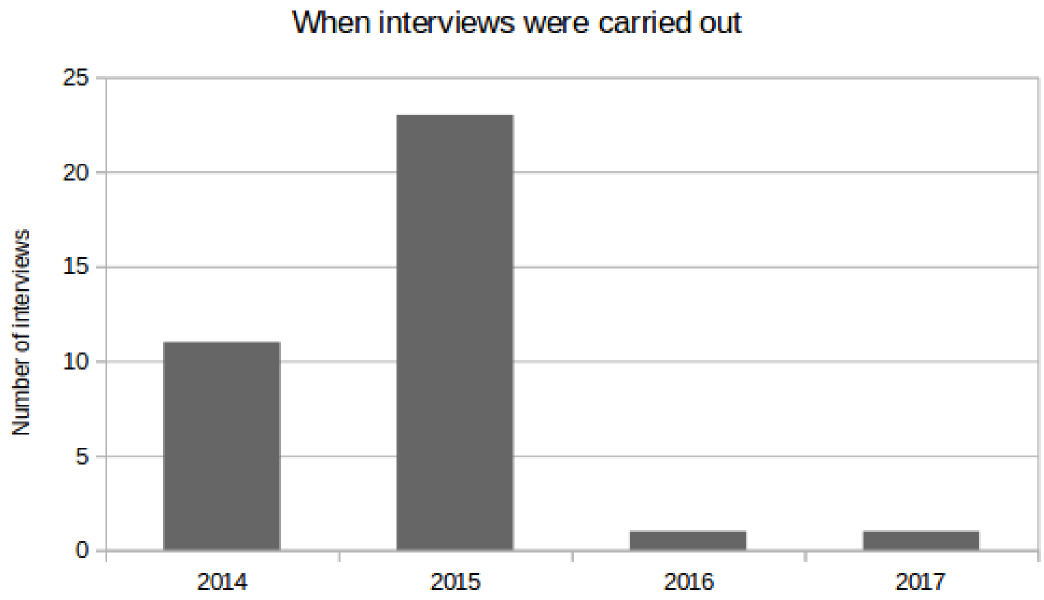

Figure 14 – The years in which the interviews were carried out

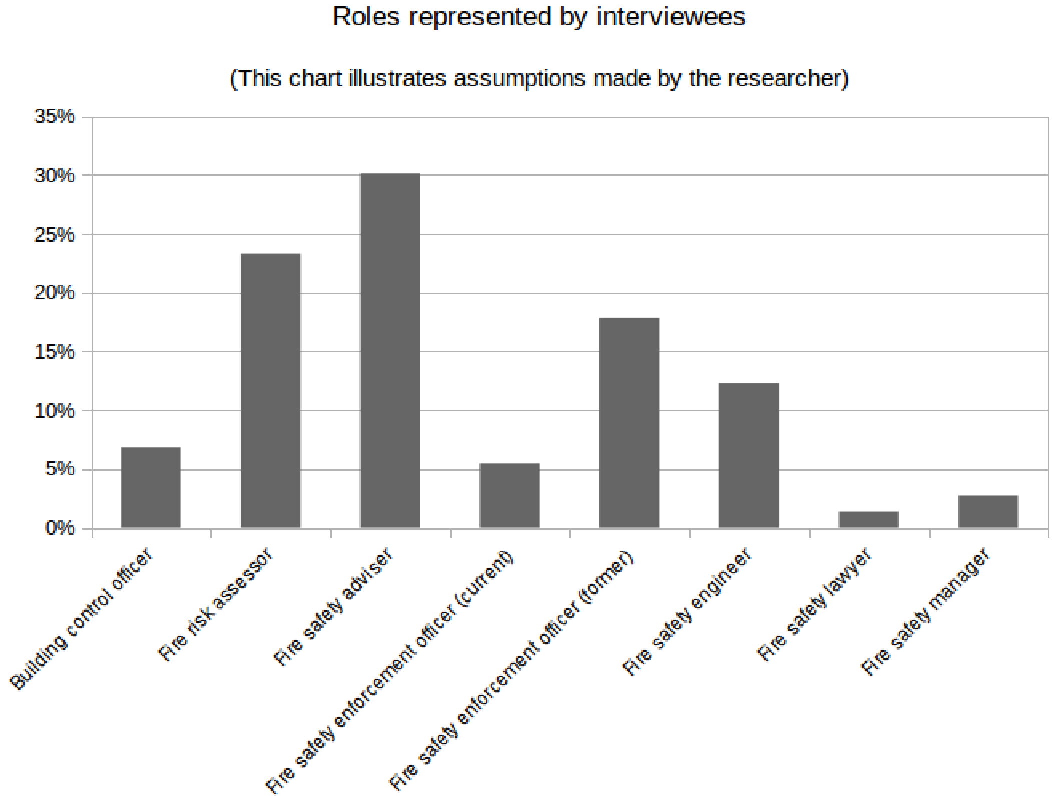

Figure 15 – Roles represented by Interviewees

Appendix 2: Interview questions

These sets of questions constitute the framework of questions that were asked of the interviewees. The questions were used to stimulate discussion but were refined on an individual basis by the researcher's knowledge of the interviewee's experiences and activities to tease out information on emergent issues.

The questions are divided into categories based on the assumed role of the interviewee:

Questions for the fire safety engineer:

1. How do you approach your role in the pre-construction design team and how do you understand or perceive your role?

2. As a member of the pre-construction design team, you inevitably have to make allowance for other disciplines as well as the design of the building itself. This means that the building design is inevitably compromised, how do you approach compromise?

3. What happens and what is the extent of your involvement if you learn of any subsequent changes to the fire safety strategy between your leaving the design team and before the plan is approved?

4. Do you have a profile of the future building occupier in mind when setting out your proposal for the fire safety design?

5. What lengths do you go to to make sure that the package of fire safety information, intended for the occupier, is read and understood by the occupier?

Questions for the fire safety officer (acting as a consultant in the pre-construction plan approval process):

1. How do you determine that a set of building plans complies with the building codes?
2. Do you verify the sincerity, comprehensiveness, and completeness of the package of fire safety information put together for the building user?

Questions for the fire safety manager:

1. Do you have the package of fire safety information that either originated with the pre-construction design team before the building was constructed or was bequeathed to you by a predecessor?
   (a) If yes:
      i. was it comprehensive?
      ii. was it relevant to the way that you use the building?
      iii. was it coherent and in a form that was easy to understand?
   (b) If no package of fire safety information was made available to you:
      i. how did you approach the task of working out your own fire safety strategy?
      ii. how did you document it?
2. When you extend or alter the building or when your business alters its methods:
   (a) how do you revise the fire safety rules?
   (b) how do you document the changes?

Questions for the fire risk assessor:

1. What information do you need to carry out a fire risk assessment?
2. How do you determine that you have sufficient information?
3. Is there a relationship between the information you have garnered to carry out your fire risk assessment and the original information determined and bequeathed by the pre-construction design team?
4. What efforts do you make to ascertain the effectiveness of relevant fire safety management practices?

Questions for the fire safety officer (acting as a post-construction enforcement officer):

1. When enforcing the post-construction fire safety regulations:
   (a) how do you determine a breach of the regulations?
   (b) do you take into account the building user's interpretation of the fire safety knowledge inherent in the building?
   (c) do you take into account how the building user manages fire safety and, if so, how do you evaluate this?
   (d) when gathering evidence for a prosecution, do you take into account the original fire safety knowledge determined and bequeathed by the pre-construction stage design team?